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NITROGEN OXIDES:
AN ANNOTATED BIBLIOGRAPHY

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Approximately 1500 abstracts of technical literature related to nitrogen oxides and air pollution are presented. The abstracted literature was collected from many sources; all are now included in the information retrieval system of the Air Pollution Technical Information Center (APTIC). Most of the literature is recent (1959-1970). The abstracts are arranged in thirteen broad subject categories. Subject, author, and geographic location indexes are included. The author index lists first and second (if any) authors individually. The geographical location index includes two sections; United States (states/cities); and Foreign (countries/cities).

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Raleigh, North Carolina
August 1970

The AP series of reports is issued by the National Air Pollution Control Administration to report the results of scientific and engineering studies, and information of general interest in the field of air pollution. Information reported in this series includes coverage of NAPCA intramural activities and of cooperative studies conducted in conjunction with state and local agencies, research institutes, and industrial organizations. Copies of AP reports may be obtained upon request, as supplies permit, from the Office of Technical Information and Publications, National Air Pollution Control Administration, 1033 Wade Avenue, Raleigh, North Carolina 27605.

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NITROGEN OXIDES:
AN ANNOTATED BIBLIOGRAPHY

INTRODUCTION

The primary objective of this publication is to collect, condense and organize existing literature on the nitrogen oxides.

Oxides of nitrogen are important in the air pollution problem, since the complex chain reaction that produces smog is initiated by the photolysis of nitrogen dioxide. In sufficient concentrations, nitrogen oxides themselves may be toxic to humans and vegetation.

The seven recognized oxides of nitrogen that may contaminate man's atmosphere, listed according to their molecular weight, are:

1.	Nitric oxide	NO
2.	Nitrous oxide	N_2O
3.	Nitrogen dioxide	NO_2
4.	Nitrogen trioxide	NO_3
5.	Nitrogen sesquioxide	N_2O_3
6.	Nitrogen tetroxide	N_2O_4
7.	Nitrogen pentoxide	N_2O_5

Of the seven, nitric oxide and nitrogen dioxide, are the most commonly encountered because of their relative atmospheric stability and their manner of generation. Generally these two are considered together as atmospheric nitrogen oxides (NO_x).

Several types of occupational exposures to nitrogen dioxide have long been recognized as potential hazards. The widespread persistence of nitrogen oxides from gasoline engine exhaust and from other community sources, however, have recently made it mandatory to know more about the biological effects and physical and chemical properties.

Abstracts of approximately 1,500 documents are presented here. The documents were collected from many sources, and all are included in the inhouse information, storage, and retrieval system of the Air Pollution Technical Information Center (APTIC). Most of them are from recent literature (1959-1970); however, some abstracted documents date from the early part of this century.

Abstracts are arranged in the categories listed on the Contents page of this bibliography. Each category is designated by a letter of the alphabet; each abstract is designated by its APTIC accession number. Numbers within each category are arranged in ascending order. Accession numbers are assigned as literature is received in APTIC. No structure is designed into the numbering system; however, recent literature is more likely to have higher accession numbers.

A subject index and an author index follow the abstracts; they refer to the abstracts by category symbol and APTIC number. The author index lists two authors when the authorship is two or more. The first author is indicated by an asterisk (*). A geographical location index divided into two sections: United States (states, cities) and Foreign (countries, cities) is also included.

This compilation of abstracted documents is composed of selected references, and no claim of all-inclusiveness is made. It is intended as a balanced sample of available literature.

All documents abstracted herein are currently on file at the Air Pollution Technical Information Center, 1033 Wade Avenue, Raleigh, North Carolina 27605. Readers outside the National Air Pollution Control Administration (NAPCA) may attempt to obtain duplicates of documents directly from libraries, publishers, or authors.

GENERAL

00164

STATISTICS ON PARTICULATE CONTAMINANTS - SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT (FIRST QUARTER 1966). San Diego Dept. of Public Health, Calif. Mar. 1966. 7 pp.

First Quarter 1966 Statistics on Particulate Contaminants San Diego County Air Pollution Control District are presented. Data are included on weight concentrations from high volume filter samples, soiling indexes, and hourly averages of gaseous contaminants.##

02237

J.P. Dixon J.P. Lodge

AIR CONSERVATION REPORT REFLECTS NATIONAL CONCERN. Science 148, 1060-6, May 21, 1965.

Pollutants, sources, political and economic factors, and the role of scientists in the formulation of public policy is examined in the light of present knowledge.##

02951

A. C. Stern

AIR POLLUTION AND ITS ABATEMENT IN THE UNITED STATES. De Ingenieur 77, (29) G83-93, July 16, 1965 and 77, (31) G97-104, July 30, 1965. (Presented before the Dept. for Public Health Engineering, Royal Inst. of Engineers, Hague, Netherlands, July 3, 1964.)

In the United States, visible smoke is no longer a major problem. Present concern is principally with gases; their chemical reactions in the atmosphere; the effects of both gases and reaction products on humans, animals, plants, materials and visibility; and their abatement. Considerable emphasis is placed on the relation of meteorological conditions to air pollution levels. Forecasting of weather conditions conducive to build-up of pollution is now done routinely in the United States. Although air pollution research is conducted nationally, abatement is on local basis. The new Federal Clean Air Act seeks to improve the effectiveness of local agencies, and to provide for Federal abatement of interstate air pollution. (Author summary)

03058

A. P. Altshuller.

AIR POLLUTION: PHOTOCHEMICAL ASPECTS. Science 151, (3714) 1105-6, Mar. 4, 1966

This paper gives a brief summary of presentations at the Symposium on the photochemical aspect of air pollution, which was held April 1965 in Cincinnati, Ohio. Topics ranged from the measurement of solar radiation in the ultraviolet region of the biological aspects of irradiation of model systems in the laboratory to the relation between meteorological parameters and chemical effects in polluted atmospheres.##

03085

A.C. Stern

PRESENT STATUS OF ATMOSPHERIC POLLUTION IN THE UNITED STATES. Am. J. Public Health (Presented at the 86th Annual Meeting, American Public Health Association, St. Louis, Mo., Oct. 29, 1958.) 50, (3) 346-56, Mar. 1960

The status of air pollution in the United States is reviewed in terms of knowledge availabe and action taken to deal with this problem. Studies by the National Air Sampling Network, state, and local health agencies are reviewed. Facilities for training persons for air pollution work are discussed, and the Federal Air Pollution Engineering Research and Technical Assistance Program is surveyed. (Author abstract)##

03205

D. Epstein.

DETECTION AND PREVENTION OF AIR POLLUTION IN THE USSR. Detection et prevention de la pollution atmospherique en U.R.S.S. Pollut. Atmos. (Paris) 8, (31) 273-83, Sept. 1966.

The problems of the toxic amounts of air pollutants (CO, SO2, H2SO4, NO, and 3, 4-benzopyrene) are described and the criteria for standardization in Russia given. The methods for detecting toxic proportions of these pollutants are given in detail, the techniques used for animal experimentation, and studies of the tests applicable to mankind and the techniques of applying them are described in particular. The paper mentions that since chronaxie was judged insufficiently sensitive, the Soviet authors resorted to electroencephalographic methods which reveal an electrocortical reflex for small amounts of polluting agents. These tests involving instantaneous maximum admissible concentration are supplemented by statistically analyzed experiments on animals. (Author summary)##

03401

F. Bonamassa

DESIGN CONSIDERATIONS OF A PHOTOCHEMICAL-ATMOSPHERE ENVIRONMENTAL TEST FACILITY. Am. Soc. Testing Mater., Spec. Tech. Publ. 352, 32-9 pp., Dec. 1963. (Presented at the Symposium on Air-Pollution Measurement Methods, Los Angeles, Calif., Oct. 5, 1962.)

A photochemical-atmosphere environmental test facility is a system designed to stimulate in the laboratory conditions existing in polluted atmospheres. These test environments are finding increasing applications in studying the effects of contaminated atmospheres on humans, animals, plants, or inaminate objects; evaluating air-pollution control systems; establishing air quality standards and permissible contaminant-emission levels; idenitfying atmospheric pollutants and their reaction products; and investigating the mechanisms of reactions of polluted atmospheres. Many interdependent factors influence the design of a photochemical-environment test facility. Careful study of the proposed experimental program and its objectives is needed to determine the required test volume and operating conditions. The design and choice of construction materials reflect certain compromises, usually dictated by the relative importance of the various test conditions. Although probably no simulated photochemical atmosphere can ever completely reproduce all the conditions of the natural atmosphere, enough control over significant variables can be achieved to enable the test environment to assume an increasingly important role in increasing our understanding of the complex reactions and effects of photochemical air pollution and in providing much needed information for its effective control.##

03438

B. C. Blakeney and M. D. High.

CLEANER AIR FOR NORTH CAROLINA (A SURVEY AND APPRAISAL FOR AIR POLLUTION PROBLEMS). North Carolina State Board of Health, Raleigh, Div. of Sanitary Engineering and Public Health Service, Washington, D.C. Div of Air Pollution. Sept. 1959. 62 pp.

The most frequently occurring air pollution problems attributed to industrial and municipal establishments results from emissions of smoke, soot, or fly ash from fuel burning equipment. The lumber, wood and furniture industries are frequently sources of dust. Asphalt paving material plants create more acute air pollution problems than any other industry. Pulp and paper mills are the cause of odor complaints and are considered the cause of some property damage. A variety of waste disposal operations emit excessive smoke and odors. In eight cities, open dumps have caused complaints and in five cities semi-landfills (burning before covering) have resulted in public request for relief. Control of gases, dusts, and other pollutants cannot be legally required by the State except through the Nuisance Code or indirectly through some other statue. The lack of specific State legislation limits the control of air pollution to the jurisdictional area of a few cities, whereas pollution of community air is not confined to man-made boundaries or jurisdiction. Existing and potential air pollution problems requiring further investigation are discussed.##

03547

M. W. Korth, R. C. Steward, R. C. Stahman

DEVELOPMENT OF A CYCLE CONTROLLER FOR CHASSIS DYNAMOMETER. Preprint. (Presented at the 57th Annual Meeting, Air Pollution Control Association, Houston, Tex., June 21-25, 1964, Paper No. 64-82.)

A closed-loop speed feedback control system has been developed for a chassis dynamometer; the system permits precise speed control of an automobile following a cycle that represents average driving conditions. This system, when used in conjunction with a variable-length cruise-mode device, permits the generation of consistent exhaust emissions from an automobile being used to charge large irradiation chambers with dilute exhaust gas during lengthy air pollution experiments. The application of this control system is being extended to include operation with a range of vehicles having widely varying power and response characteristics. (Author abstract)##

03556

M. Katz.

SOME TOXIC EFFECTS OF AIR POLLUTION ON PUBLIC HEALTH. Med. Serv. J. (Can.) 16, 504-25, June 1960.

Nature of atmospheric contamination is reviewed. Brief descriptions are given of air pollution episodes, legislation, epidemiology, sources of air pollution and their effect on health. Air pollution research in Canada is summarized.##

04052

R. Haddad and J. J. Bloomfield

ATMOSPHERIC POLLUTION IN LATIN AMERICA. Bol. Ofic. Sanit. Panam. 58, 241-9, Sept. 1964. Sp. (Tr.) (Presented at the Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement, Geneva, Switzerland, Aug. 6-12, 1963.)

Latin America is an area which is experiencing a very rapid population and industrial expansion. Although this growth is very irregular, the cities which exceed a million inhabitants and the industrial concentration in them is growing yearly. This phenomenon has resulted in serious problems of air pollution in Sao Paulo, Brazil, Santiago, Chile, Mexico City, Mexico, which are in need of further investigation and control as quickly as possible. There are potential problems in Buenos Aires, Argentina, and in all those large metropolitan centres which are growing and industrializing rapidly. The situation created in Lima, Peru, because of the fishmeal industry, seems to be fairly well controlled. The greatest necessity is to train personnel capable of conducting studies in measuring air quality and controlling the contamination of the air. There is also a necessity to create a consciousness of the seriousness of the problem among government authorities and the public in general. It is hoped that the future development of the Institute of Occupational Health and Air Pollution Research in Santiago, Chile, will contribute effectively to achieve these objectives.##

04212

S. Abe

THE PRESENT STATUS OF AIR POLLUTION. Clean Air Heat Management (Tokyo) 15, (7-8) 7-18, Aug. 1966. Jap.

The present status of air pollution in Japan is given naming the kinds of contaminants and their origin, factors affecting contamination density, and various types of smog. The types of contaminants are: 1) minute particles (less than 1 micron in size) such as found in soot, carbon, ashes, dust; 2) coarse particles (greater than 1 micron in size), as found in dust, ashes, and minerals; 3) reactive substances found in mist, fog, and vapor such as SO_2, SO_3, H_2S, CO_2, CO, NO_2, N_2O_3, O_3, aldehydes, HCl, NH_3, HF, Pb, Hg, Cd, As, Be and 3,4-benzpyrene. The contaminants originate from factories, chemical plants, power stations, domestic heating, public baths, hotels, laundries, dry cleaning establishments, hospitals, schools, and public buildings. Also discussed are the human factors affecting air pollution such as public awareness and interest, seasonal, weekly, and daily changes in heating and cooking. Meteorological aspects are covered such as wind direction and velocity, turbulence, temperature, rain and snow. The types of smog found in New York, London, Los Angeles, Pittsburgh, and Yokkaichi are described. Graphs and tables list symptoms and diseases affecting plants and humans and give the density of dust particles and SO_2 in the main cities of Japan. Data on the sulfur content of various oils produced by Japanese refineries and on the number of Japanese automobiles produced is included for information on emission sources of pollutants.##

06722

A. Goetz

PARAMETERS. Symp. Environ. b8measurements, Cincinnati, Ohio, 1963. (PHS Publ. No. 999-AP-15.) (July 1964). pp. 29-34.

Air and water as gaseous and liquid components of the environment are considered essential ingredients for human, animal, and plant life -- ingredients that are also acted upon by these live forms. Air and water are evaluated in terms of chemical and physical parameters relating to their occurrence in the natural regenerative and degradative cycle and to their physiological assimiliation. Particulate pollutants and reactive gases are discussed. Emphasis is given to the physical and chemical characteristics of aerosols and their potential role as pollutants of environmental significance. (Author's summary)##

06723

J. S. Nader

DATA ACQUISITION SYSTEMS IN AIR QUALITY. Symp. Environ. Measurements, Cincinnati, Ohio, 1963, (PHS Publ. No. 999-AP-15.) (July 1964). pp. 107-23.

Two major automated data acquisition systems are now being used in the United States for air quality measurements. These systems, operated by the Los Angeles County Air Pollution Control District and by the U.S. Public Health Service (Continuous Air Monitoring Program), are reviewed in detail; plans for automated data handling by the California State Health Department are discussed briefly. Design and operation of these systems are reviewed in terms of sampling, detection, recording, data validation, and data display. (Author's summary)##

06744

T. Suzuki

AIR POLLUTION IN JAPAN. Kuki Seijo (Clean Air - J. Japan. Air Cleaning Assoc., Tokyo) 2, (2) 1-4, 1964. Jap.

The nature of air pollution in Japan has been changing. Pollution from the chemical industry, petroleum processing, and automobiles has become more prevalent than dust and soot from coal and heavy fuel oil. At present, the degree of air pollution is indicated primarily by the amount of dust and soot fall and concentration of SO2 and floating dust, and secondarily by the concentration of carbon monoxide, nitrogen oxides, and hydrocarbons. Use of heavy oil and coal of very low grade makes the situation worse. General considerations of the effects of pollutants on the human body are given. Studies made by the Yamaguchi Medical School on floating dust and SO2 indicate a correlation between concnetration and death rate. Mention is made of the now familiar "Yokohama Asthma". It was found that in Yokkaichi city, air pollution is especially heavy when the wind velocity is greater than 5 m/sec and SO2 is highly concentrated. The death rate from lung cancer in Hokkaido for 1950 to 1960 was 1.6 times as great as the mean value for the rest of Japan. Maximum allowable concentrations of various pollutants are tabulated for the United States, Soviet Union, and West Germany.##

07535

W. Leithe

CLEAN AIR MAINTENANCE - AN IMPORTANT TASK FOR CHEMISTRY AND ECONOMY. (Reinhaltung der Luft - ein dringendes Anliegen fur Chemie und Wirtschaft.) Text in German. Allgem. Prakt. Chem. (Vienna), 18(8):239-241, Sept. 10-17, 1967. 4 refs.

This article is a summary of two lectures given at meetings of chemical societies. The problem of air pollution and some control methods are outlined. Typical examples of well-known air pollution problems are mentioned: London's smog chiefly caused by domestic heating, the smog of Los Angeles due to automobiles, the sun, and temperature inversions, and the industrial air pollution of the Ruhr Valley. Some characteristic data for all three examples are quoted. The techniques for the control of dust emissions are farthest advanced. This is verified by the fact that in Germany, emission of cement dusts decreased to one third while the production of cement tripled in the last 17 years. Far less satisfactory is the control of SO2 emissions. About twice as much sulfur is blown into the air than is used for the production of sulfuric acid. Some wet and dry processes for the elimination of SO2 from smoke are mentioned, but no method is known today which is both effective and economical. The chemical industry tackled its problems mostly by reducing the emission of air polluting substances by increasing the efficiencies of the relevant chemical processes. Examples are the production of sulfuric acid and nitric acid. Organic compounds can be recovered by either absorption on activated charcoal or oxidation by catalytic afterburners.##

07845

Parker, A.

WHAT'S IN THE AIR J. Inst. Fuel, 40(315):173-175, April 1967.

We each breathe about 35 lb of air in a day, consume 3 to 4 lb of drinking water and 1 1/2 lb of dry food. This provides energy by oxidation of carbon and hydrogen of which the thermal value is about 12,000 Btu. equivalent to that provided when 1 lb of coal is burnt. Some of this energy is given out as heat, say about 400 Btu/h. Records of smogs in various countries since 1873 exist, but that in London in 1952 had great effect leading to the b8beaver Report and the b8clean Air b8act, 1956. 2.7 million ton of smoke were discharged into the air during 1938 in Britain, of which 63% was from domestic sources, 10% from railways and 27% from industry. This was reduced to 1.1 million tons in 1965, of which 0.9 million, 80%, was from domestic sources. This reduction was also helped by the rationing of coal during the years of World War II and by the desire for cleaner domestic heating methods. 4.1 million tons of sulphur dioxide were discharged into the atmosphere in Britain in 1938 and 6.4 million tons in 1965, but the concentration of SO2 in the air near the ground has stayed the same. The problem is not yet solved. About 14 million motor vehicles in the U. K. emitted perhaps 5 million tons of carbon monoxide and 1/4 million tons of hydrocarbons in 1965. The interaction of hydrocarbons, oxides of nitrogen and ozone, in sunlight causes the smogs of Los Angeles in which visibility is scarcely reduced and so they are of a different character from London smogs. The International Union of Air Pollution Prevention Associations was recently founded. Its first international clean air congress was held in London in October, 1966. (Author's abstract)##

08237

DISCUSSION ON TRENDS IN AIR POLLUTION. Arch. Environ, Health, Vol. 8, p. 31-38, Jan. 1964.

A discussion is presented, verbatim, from the 6th Annual Air Pollution Medical Research Conference held Jan. 28 - 29, 1963, in San Francisco. Among the participants were: Dr. Arie Haager-Smit (chairman); Professor Albert Bush; Dr. A. P. Altshuller; and Dr. J. T. Middleton. The topics discussed include: mortality from respiratory and other diseases in California; diesel and gasoline engine emissions; plant damage and aldehydes; cigarette smoking; and air-borne allergens.

09310

Kalika, Peter W.

THE GROWING PROBLEM. Mach. Des., 39(17):19-21, July 20, 1967.

The facts, figures, and concern about the national problem of air pollution are covered. Past air pollution episodes, sources and types of pollutants released in the atmosphere, and the mechanisms and characteristics of temperature inversions are reviewed.

09780

Environmental Science Services Corp., Stamford, Conn.

AIR POLLUTION CONTROL PRIMER. 35 p., ((1968)).

The main sources of air pollution are combustion processes, especially internal combustion engines. In a general manner the following are discussed: causes and effects of air pollution; legal aspects; automobile emissions; fossil fuels and lead additives; and control equipment and its market potential.

00984

S. Tilson

AIR POLLUTION. Intern. Sci. Technol. No. 42:22-31, 1965.

The problem and the approaches to solving it are reviewed. Pollution sources, research, air quality criteria, the need for controls, social attitudes, standards, photochemical reactions, and future prospects are included.##

01073

V.G. MacKenzie

AIR POLLUTION - WHOSE PROBLEM? Preprint. (Presented at A Panel Discussion on Air Pollution at the Board of Directors Meeting, National Petroleum Refiners Association, Washington, D.C., Sept. 20, 1965.)

The need for conservation of air as a natural resource is discussed, with emphasis on the role of the petroleum industry. Wats and means for improving on past patterns of conservation effort through Federal authority under the Clean Air Act, establishment of automotive emission standards, and application of technology to control of sulfur oxides and automotive emissions are delineated. Attention is called to the need for research on oxides of nitrogen and lead contamination. It is suggested that business leaders, by their leadership in research and education, can play a significant part in alleviating environmental health problems.##

01211

J. A. Maga

AIR RESOURCE MANAGEMENT IN THE SAN FRANCISCO BAY AREA. (California State Dept. of Public Health, Bureau of Air Sanitation). California Univ., Berkeley, Inst. of Governmental Studies. 1965. 42 pp.

Author reviews the problems of air pollution in the San Francisco Bay Area, stressing the need for effective air quality standards. Topics covered in the report (all germane to the San Francisco Area) are: Air Pollution in the Metropolis; the concept of Air Pesource Management; Weather, Topography and the Regional Air Resource; Air Pollution and its Effects; Air Pollution and its Relationship to other Regional Problems; a regional approach to the Control of Air Pollution; Control Programs in the Bay Area; and the outlook for the Bay Area.##

01640

M. Katz

SOME ASPECTS OF THE PHYSICAL AND CHEMICAL NATURE OF AIR POLLUTION. World Health Organization Monograph Ser. (Air Pollution). No. 46 1961. pp. 97-158.

This chapter of the WHO Monograph reviews works on air pollution accomplished within the last ten to 15 years. The subject of the physical and chemical nature of air pollution is so broad and covers many fields of physics, chemistry and medicine that only the most important works have been highlighted. Discussed among others were the following problems: The development of improved methods and techniques for the measurement, separation and identification of air contaminants, the standardization of methods of sampling and analysis of common air pollutants, the application of meteorological concepts and diffusion theory to the study of the dispersion of pollutants in the atmosphere, the formation of smog and the prediction of pollution levels, the development of improved analytical techniques, instrumentation and studies of motor vehicle exhaust gas composition under various operating conditions and the development of catalytic and other exhaust gas system control devices, the study of the action of sunlight on motor vehicle and traffic gas and of photochemical atmospheric reaction in general, the determination of the health and other effects of irradiated gaseous and vapour pollutants, the continued study of carcinogenic and other toxic substances presented in the urban environment and the evaluation of their effects on health, and the study of radioactive pollutants and their effects in connection with the development of industrial uses of nuclear energy for power and transportation.##

11227

J. E. Yocom

AIR QUALITY. In: Instructional Material for the Connecticut Air Pollution Simulation Model Program Travelers Research Center, Inc., Hartford, Conn., 10p., 1968. 2 refs. (Presented at the TRC Seminar, Hartford, Conn., Oct. 12, 1968.)

The nature and composition of clean air itself is reviewed. An almost infinite number of individual chemical compounds, singly and in combination, and existing in a variety of physical forms contribute to community air pollution. The most important pollutants and classes of pollutants found in majority of communities may be listed within five categories: carbon monoxide, hydrocarbons, nitrogen oxides, sulfur oxides, particulate matter. A discussion of each is presented to show their sources and importance in air pollution problems. Criteria background information which is required prior to setting air quality criteria for SO2 and other pollutants is presented.##

12177

John T. Middleton

AIR QUALITY AS A CONTROLLING FACTOR IN LIFE PROCESSES. In: Biometeorology, Proceedings of the Twenty-Eighth Annual Biology Colloquium, 1967, William P. Lowry (ed.) p. 67-79, 1967. (4) refs.

The quality of air is determined by the uses made of it and by the pollutants injected into it by man. The quality of air varies for a number of reasons, but principally because of contaminants arising from economic and social developments throughout the world. Air pollution is one of the undesirable side effects of this growth and development. The extent, severity, and character of man-made air pollution are determined by the kind, number, and location of contaminant sources, the chemical reactivity and interaction of the pollutants, the topography of the land, the weather, the nature of the community, and the characteristics of the airshed.##

14732

Mueller, Harald

POWER ECONOMY AND AIR POLLUTION. (Energiewirtschaft und Luftverunreinigung). Text in German. Electro-Techniek (The Hague), 46(20):421-430, Oct. 3, 1968. 89 refs.

Types of pollutants, the effects of air pollution on humans, animals, plants, and materials, as well as control measures taken by power plants are reviewed. About 20 to 35% of the solid pollutants in the atmosphere comes from domestic heaters, 35% from industries, and 25% from automobile exhaust gases. Of the gaseous pollutants, the most dangerous is SO2. Regulations in Russia limit their concentration in the atmosphere to 0.06 ppm. In Gelsenkirchen in the Ruhr valley, Germany, a concentration of 0.12 ppm has been measured. The threshold limit value (TLV) referred to eight-hour daily exposure has been set at 5 ppm for NO2. Electrostatic precipitators, mechanical separators, centrifugal separators, scrubbers, and bag filters are all used by power plants. Desulfurization of flue gases and of the fuel is also mentioned as a possible solution. High stacks positively influence the dispersion process. The power output by the plants erected in 1950 rose 375% by 1963. Dust emission, however, has been reduced to 70% of the 1950 value.

EMISSION SOURCES

00020

J. R. Goldsmith and L. H. Rogers

HEALTH HAZARDS OF AUTOMOBILE EXHAUST. Public Health Rept., 74(6):551-558, June 1959.

Of the substances which occur in automobile exhaust and their reaction products, hygienic standards have been established for industrial exposure to carbon monoxide, nitrogen dioxide, lead, and ozone. Establishing a full set of levels for community exposures to these substances is very difficult because of the sensitivity of frail or ill individuals, the indeterminate period of exposure, the effect of agents in combination, and the cumulative effect of exposure from other sources, such as cigarette smoking. The hazard of automobile exhaust to the population of a large community will depend, among other things, on the extent and way that vehicles are used, and the meteorology of the area. In the absence of effective control for air pollution from automobile exhaust, the public health hazard should be evaluated. (Author)##

00024

V. G. MacKenzie

THE POWER INDUSTRY AND AIR POLLUTION. Public Health Service, Washington, D.C., Div. of Air Pollution, Nov. 28, 1962. 12 pp.

The relation between the power industry and air pollution is discussed concerning its role in meeting high energy production and its obligation toward meeting the national problem of air pollution. The following topics are discussed: (1) nature of power industry emissions, (2) the sulfur dioxide problem, (3) means of controlling emissions, and (4) control of nitrogen and sulfur oxides. (A paper based on remarks made by V. G. MacKenzie at the 1962 Annual Meeting, Association of Edison Illuminating Companies, Boca Raton, Fla., Nov. 28, 1962.)##

00027

A. H. Rose, Jr., M. Corn, R. R. Horsley, D. R. Allen, and P. W. Kolp

AIR POLLUTION EFFECTS OF INCINERATOR FIRING PRACTICES AND COMBUSTION AIR DISTRIBUTION. J. Air Pollution Control Assoc. 8(4):297-309, Feb.1959.

The relationships between incinerator design criteria and resulting atmospheric contaminant discharges were investigated. Tests were made by burning a fuel of constant composition in a prototype, multiple-chamber incinerator under controlled conditions. Effects of variables were measured by analyzing the flue gases for solids, hydrocarbons, oxides of nitrogen, and CO. The series of tests reported was made to (1) provide information on the relative importance of such variables as stoking and amount of fuel per charge insofar as they affect the production of atmospheric pollutants, and (2) evaluate the chosen levels of variables such as excess combustion air, underfire and secondary air distribution, and fuel charging rate. Production of particulates was highly dependent on the amount of excess combustion air and the percentage of this air entering under the fuel bed. At the 50% excess air level, particulate discharge increased when underfire air was increased from 15% to 30% of the total combustion air. This did not hold true for the 150% excess air level. Reduction of hydrocarbons and CO appeared to be more dependent on the level of excess combustion air available than on its distribution between overfire, underfire, and secondary air. These pollutants were produced under combustion with 50% excess air but not with 150% excess. Production of oxides of nitrogen depended on the rate of fuel charging, the amount of excess air, and the gas temperature in the ignition zone. (Author)##

00030

W. S. Smith

ATMOSPHERIC EMISSIONS FROM FUEL OIL COMBUSTION (AN INVENTORY GUIDE). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution, (999-AP-2.) Nov. 1962. 102p.

This review provides a guide for the inventorying and control of emissions arising from the combustion of fuel oil. Information was collected from the published literature and other sources. The report is limited to information on oil used as a source of heat or power (exclusive of process heaters). The data were abstracted, assembled, and converted to common units of expression to facilitate understanding. From these data, emission factors were established that can be applied to fuel oil combustion to determine the magnitude of air-contaminating emissions. Also discussed are the compositions of fuel oils; the preparation and combustion of fuel oil; and the rates of emission, their variables, and their control. (Author)##

00052

MOTOR VEHICLES, AIR POLLUTION AND HEALTH (A REPORT OF THE SURGEON GENERAL TO THE U.S. CONGRESS IN COMPLIANCE WITH PUBLIC LAW 86-493, THE SCHENCK ACT). Public Health Service, Washington, D.C., Div. of Air Pollution. June 1962. 463 pp.

"Motor Vehicles, Air Pollution, and Health" is a report prepared by the Division of Air Pollution of the Public Health Service as directed by the Congress in Public Law 86-493.

The Report is presented in three parts as follows: Part I. Summary--A Review of the Problem; Part II. Effects of Motor Vehicle Pollution on Health; Part III. Air Pollution from Motor Vehicles. Part I summarizes current information and theories of the nature of air pollution resulting from emissions from motor vehicles. It also examines approaches to the reduction of such pollution, and some of the problems associated with control measures. Finally, it presents an appraisal of the biological effects, proven or potential, of such pollution. Part II reviews, in detail, information which has been reported concerning the influence of air pollution on health, with particular reference to the effects from pollution arising from the operation of motor vehicles. The results of mortality and morbidity surveys, of laboratory research, and of other pertinent investigations are given. The responses of vegetation and animals, as well as of humans, to individual contaminants as well as to mixtures, such as are encountered in the atmosphere, are examined. Part III describes, in some detail, how motor vehicle operation elates to emissions of pollutants, the magnitude of the pollution problem, the nature of chemical reactions in the atmosphere, factors affecting concentrations, methods for reducing pollution, and the subject of ambient air and emission standards.##

00054

A STUDY OF AIR POLLUTION IN THE INTERSTATE REGION OF LEWISTON, IDAHO, AND CLARKSTON, WASHINGTON. Public Health Service, Cincinnati, Ohio, Div of Air Pollution.(999-AP-8.) Dec. 1964. 166p.

As a result of an increasing number of complaints from citizens about reduced visibility, damage to house paint, tarnishing of silver, undesirable odors, and suspected effects of air pollution on health, Idaho and Washington and Lewiston and Clarkston officials requested assistance from the U.S. Public Health Service. Subsequently, the Public Health Service, the two states, and the two cities agreed to undertake a cooperative study; the two cities participated in the study. The purpose of the study was to determine the nature and extent of air pollution in the two-city area and to assemble information to be used as a basis for technical and official action needed to conserve air quality in the area. Because of its unique valley location, the two-city area is susceptible to meteorological conditions conducive to pollutant accumulation. Either city can contaminate the other, and this creates a multi-jurisdictional problem that requires joint and cooperative action to control air pollution. As a first step to solve the problem, an Air Resources Management Council consisting of county, city, and state officials is to be organized. This council will be responsible for planning surveys and studies to determine air quality guides and legislation and administration necessary to control air pollution in this multi-jurisdictional area. The Public Health Service in its advisory capacity will provide technical assistance. (Author)##

00081

R.T. Arnest

ATMOSPHERE CONTROL IN CLOSED SPACE ENVIRONMENT (SUBMARINE). Naval Medical Research Lab., New London, Conn., Bureau of Medicine and Surgery, (Rept. No. 367.) Dec. 14, 1961. 39 pp.
CFSTI, DDC: AD 270896

The purpose of this work was to make a general summary of the toxicological problems associated with the closed space environment of submarines and to review the current state of development of tools for measuring and removing the problem substances involved. More than twenty-five atmospheric contaminants are listed, their sources, and their maximum allowable concentrations (MAC) are given, as well as the symptoms they cause, the long-term effects; tools for measuring the amounts of contaminants present are described and methods of removal indicated, in so far as known.##

00107

S. S. Griswold

CONTROL OF STATIONARY SOURCES (TECHNICAL PROGRESS REPT. VOLUME 1). Los Angeles County Air Pollution Control District, Calif. Apr. 1960. 191 pp.

As a result of the intensive source control measures administered in Los Angeles County, Virtually all industrial operations have been brought within the scope of the air pollution control program. From the melting of metal to the painting of manufactured goods, specific industrial processes and equipment have been subject to air pollution control measures. This volume provides individual discussion of control techniques applied to the most significant stationary sources of air contamination. Certain source emission problems, such as those traceable to the operation of railroad locomotives and ships, are not discussed in this volume in view of the current unimportance of the source. The material reported in this volume generally contains only those developments occurring subsequent to the publication of the Second Technical and Administrative Report on Air Pollution Control in Los Angeles County, 1950-51. (Author)##

00109

A. P. Altshuller

REACTIVITY OF ORGANIC SUBSTANCES IN ATMOSPHERIC PHOTOOXIDATION. Public Health Service, Cincinnati, Ohio, Division of Air Pollution. (999-AP-14.) July 1965. 29 pp.

The organic vapors emitted to urban atmospheres by motor vehicles and other sources of emissions consist not only of paraffinic, acetylenic, aromatic, and olefinic hydrocarbons but also of aldehydes, ketones, alcohols, phenols and chlorinated hydrocarbons. To estimate the contribution of each of these classes of compounds to photochemical smog, one must know both their atmospheric concentrations and their relative reactivities in atmospheric reactions. A review of the available literature on concentration levels of organic vapors in urban atmospheres indicates that much more analytical work is needed. The existing data are adequate, however, for the formulation of useful estimates. Reactivities of organic substances in photooxidation reactions can be considered from many standpoints. Rates of disappearance of the organic substances, rates of disappearance of nitric oxide or of formation and disappearance of nitrogen dioxide, and rates or maximum yields of various products such as oxidant or organic nitrates all can be used as chemical measurements of reactivity. Eye irritation, various types of plant damage, and aerosol formation are indicators of reactivity that can be related only to a limited extent to chemical measurements of reactivity. The problems of developing a single index of reactivity are considered. The application of reactivity measurements to automobile exhaust composition, to control devices, and to improvements in atmospheric purity is discussed. (Author)##

00140

J. H. Fernandes, J. D. Sensenbaugh, and D. G. Peterson

BOILER EMISSIONS AND THEIR CONTROL. Combustion Engineering, Inc., Windsor, Conn., and Air Preheater Co., Wellsville, N.Y. (Presented at Conference on Air Pollution Control, Mexico City, Apr. 28, 1966.)

Emissions from combustion sources that are significant from the standpoint of air pollution include (1) particulate matter, (2) sulfur oxides, and (3) nitrogen oxides. Particulate matter is objectionable on esthetic grounds. The technology for its control well developed, although effort is constantly being made to improve collection equipment and reduce the cost of a nonproductive operation. Techniques have been developed for control of SO3 in oil-fired units by means of low-excess air and additives. Methods for control of SO3 in coal-fired boilers have not been as well developed as for oil-fired units, but there is less SO3 present with coal firing. A great deal of work has been done on control of SO2, both by fuel desulfurization and by removing the SO2 from the stack gas. Oxides of nitrogen are important as air pollutants because of their participation in the reactions leading to photochemical smog. Since the localities most subject to photochemical smog are in oil and gas burning areas, most of the work has been done on these fuels. The emission of oxides of nitrogen can be significantly reduced by using gas fuel or by use of a suitable firing method and low-excess air with oil fuel.##

00160

Campau, Robert M and James C. Neerman

CONTINUOUS MASS SPECTROMETRIC DETERMINATION OF NITRIC OXIDE IN AUTOMOTIVE EXHAUST. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, New York, Society of

Automotive Engineers, Inc., 1966, p. 325-334. 11 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966.)

Three techniques for the measurement of the oxides of nitrogen in automotive exhaust were evaluated. The techniques included a "nitrous fume" analyzer, a gaseous NO2 colorimeter, and a movable mass spectrometer. All data obtained were compared to data from currently accepted wet chemical methods, the phenoldisulfonic acid method and the "modified" Saltzman technique. Of the techniques evaluated, the mass spectrometer analysis of NO has been found to be the most useful for the study of nitrogen oxides in engine exhaust. The high cost of wet chemical analysis has indicated a need for an improved and continuous analytical method. Most analytical methods oxidize the NO present in exhaust gas to NO2 which is highly reactive with other exhaust constituents and even with the sampling systems. The mass spectrometer approach measures NO within seconds of its discharge, thus minimizing any reactions prior to measurement. Nitric oxide is monitored at the mass/charge ratio of 30, the molecular ion peak. Contributions to the m/e peak by other exhaust components such as formaldehyde and ethane are less than five percent under most engine operating conditions. For rich operation, a small correction was used for CO of molecular weight 30. The rapid response of the mass spectrometer allows monitoring of NO in automotive exhaust under transient conditions such as the California Motor Vehicle Pollution Control Board Exhaust Test Procedure. Typical MVPCB nitric oxide traces are shown with various carburetion and spark timing calibrations. (Authors' abstract)##

00186

J. H. Ludwig

SEMINAR ON AIR POLLUTION BY MOTOR VEHICLES. Public Health Service, Cincinnati, Ohio, Division of Air Pollution. 1966. 52 pp.

The contribution of motor vehicle emissions to community-wide air pollution is discussed and related to other factors involved in air pollution such as commercial and industrial sources, the size of the community and source distribution, topographical and meteorological factors, and the degree of control exercised on the sources. In particular, one section of the publication analyzes the different pollutant types emitted from diesel and gasoline engines. Another section discusses the photochemical reactions in the atmosphere known to produce air pollutants.##

00220

J. P. Sheehy, J. J. Henderson, C. I. Harding, and A. L. Danis

AIR POLLUTION IN JACKSONVILLE, FLORIDA (A PILOT STUDY - AUG.-SEPT. 1961). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution (AP-3). Apr. 1963. 65 pp.
GPO: 802-899-6

The objectives of this pilot study were: (1) To develop a preliminary opinion as to whether the city of Jacksonville has a generalized air pollution problem. (2) To determine whether certain pollutants - fluorides and SO2, were present in the atmosphere in concentrations capable of producing the damage to vegetation that had been experienced in the Jacksonville-Duval County area. To accomplish the first objective, a one-week intensive investigation was carried on in downtown Jacksonville, at Hemming Park, from August 3 to 10, 1961. To accomplish to second objective, additional studies were conducted during the periods August 4 to 12, and September 5 to 13, 1961, in the area in which damage to vegetation had occurred. The two fertilizer plants, located in the industrial area of Jacksonville, were not in production during the first phase of this study. Pollutants sampled in this study included fluorides, SO2, H2S, NO2, nitrogen dioxide, and particulates. As a result of the investigations it was concluded that: (1) Photochemical smog was being produced in the air over Jacksonville. (2) Concentrations of fluorides occurred in certain parts of Jacksonville during the period of the study that could cause damage to sensitive plants. (3) Pollutants from the city of Jacksonville can be transported across the St. John's River. H2S concentrations measured during this study were not of the magnitude known to cause discoloration of paints containing lead pigments and/or mercury base fungicides. Subsequent to the study, an incident of darkening of paints occurred in the arlington area. Therefore, it is evident that an H2S problem exists in this area. SO2 concentrations observed during this study did not reach levels known to cause damage to vegetation. However, it appears possible for SO2 concentrations to reach levels during the heating season capable of causing damage to sensitive plants, particularly in localized areas downwind of major sources of SO2.##

00250

L. C. McCabe and J. S. Lagarias

AIR POLLUTION AND THE PAINT INDUSTRY. J. Paint Technol., 38(495):210-216, Apr. 1966. (Presented at the 43rd Annual Meeting, Federation of Societies for Paint Technology, Atlantic City, N. J., Oct. 29, 1965.

The manner in which regulations on gaseous and particulate emissions affect the paint industry is reviewed with special emphasis on proposed new legislation concerning solvent emissions. Factors which influence the establishment of emission standards and ambient air quality are discussed. The inconsistencies from community to community on emission standards do not appear to be related to meteorological or local conditions. It is suggested that the setting of standards for air quality should depend upon establishing the effects of air pollutants on humans, animals, and vegetation as well as economic and meteorological considerations. A review of existing codes shows that this has not always been done. In the case of organic solvents, proposed legislation could result in substantial changes in the use of certain solvents.##

00271

W. F. McMichael and J. E. Sigsby, Jr.

AUTOMOTIVE EMISSIONS AFTER HOT AND COLD STARTS IN SUMMER AND WINTER. J. Air Pollution Control Assoc., 16(9):484-488, Sept. 1966. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 22, 1966.)

The U. S. Public Health Service, as part of its continuing investigations of automotive emissions, began a study early in 1965 to determine the effects of hot-start and cold-start engine operation on exhaust emissions. This study was conducted in the Cincinnati area in summer and winter ambient temperatures. The effects of hot and cold starts on the mass and composition of exhaust gases were compared. Emissions from the test vehicles were measured in actual traffic with a proportional sampler. The test route was developed in earlier work to represent average urban driving conditions. Data from this study reflect the effects of traffic density, route, and climate on hot-start and cold-start engine operation. (Authors' abstract)##

00288

H. C. Johnson, J. D. Coons, and D. M. Keagy

CAN MUNICIPAL INCINERATORS MEET TOMORROW'S REGULATIONS? Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-131.)

Over the last two decades, Los Angeles, the San Francisco Bay Area, and other West Coast areas have gone far beyond most other parts of the country in the nature and extent of limitations legally imposed on incinerator design and performance. With the increasing population of these areas, and the problems of other solid waste disposal methods, it seems prudent to consider whether additional or tighter limitations may be imposed as rapidly as the technology permits. It is the purpose of this paper to consider briefly some of the implications of these possibilities. It is, therefore, primarily speculative in nature. Present and future standards for incinerator emission control, incinerator performance and design considerations are discussed. (Authors' abstract)##

00319

SURVELLIANCE OF MOTOR VEHICLE EMISSIONS IN CALIFORNIA (QUARTERLY PROGRESS REPT. NO. 1, JULY - SEPT., 1965). California Dept. of Public Health, Los Angeles, Vehicle Pollution Lab. Spet. 1965. 77 pp.

The 1966 model automobiles which are sold and registered in California must be equipped with exhaust control systems or control devices which will meet California standards for the emissions of hydrocarbons and carbon monoxide. Although all control systems were thoroughly tested prior to certification these tests were performed on a limited number of preproduction model cars and their performance in the hands of the general public may differ substantially from that of the earlier test vehicles. Moreover, since the maintenance requirements recommended by the car manufacturers are not enforceable by law, the effects of quality and frequency of voluntary maintenance on emission levels need further study. Under the Federal Surveillance Grant the above conditions will be investigated on a large sampling of cars at 3 separate surveillance test stations in the Southern California area, each equipped with a chassis dynamometer and an analytical sampling train for the accurate determination of emission levels. The 1966 model vehicles equipped with exhaust control systems were not available for testing during this report period. However, test data were obtained and compiled on 2 groups of fleet vehicles. In general, both groups of vehicles were driven in a manner considered representative of the type of driving expected of private owners. Servicing of the fleet vehicles may have been different from the maintenance procedure of private owners. Results of the survey are expressed in both tabular and graphic form for cold and hot starts showing the changes in emission levels of hydrocarbon and CO with respect to mileage accumulation and/or engine adjustments. The data are presented in categories by manufacturer, State-owned Fleet, General Motors Corp., Ford Motor Co., American Motors, 2nternational Harvester, Kaiser-Willys. Data derived from the testing of the fleet vehicles will provide a basic reference pattern for comparing fleet-maintanined vehicles with: (1) the 1966 assembly line production models (with control system) sold to private owners in California; (2) the 1965 unequipped vehicles maintained by the general public.##

00324

G. C. Hass, F. Bonamassa, P. Neward, N. Kayne

THE INFLUENCE OF VEHICLE OPERATING VARIABLES ON EXHAUST EMISSIONS. J. Air Pollution Control Assoc. 17(6) 384-7, June 1967. (Presented at the 59th Annual Meeting, Air Pollution Control Assoc., San Francisco, Calif., June 20-24, 1966, Paper No. 66-69.)

This paper is a report of the operating variables and emission characteristics of a 1964 283 cubic inch V-8 Chevrolet automobile. This vehicle was used as a laboratory tool in a project to develop an improved driving cycle to represent Los Angeles peak hour driving. As a result it became necessary to run many expoloratory tests to determine the relationships between the primary variables of intake manifold vacuum, engine rpm, and vehicle speeds and acceleration rates. Emissions of hydrocarbons, carbon monoxide, and nitrogen oxides were also determined for the entire range of operating conditions. The effect of prior operating modes on closed-throttle unburned hydrocarbon concentrations was also determined. The results of these tests are presented in tables and graphs which make a comprehensive picture of one typical automobile as a generator of air pollutants. (Author's abstract)##

00337

W. R. Crouse and N. E. Flynn

SOURCE INVENTORY IBM SYSTEM FOR PARTICULATE AND GASEOUS POLLUTANTS. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-10.)

A source inventory IBM system of air pollutants is described which makes use of an existing IBM card index-registration system in an established air pollution control district and which employs efficient utilization of engineering time, including computer services, to establish and maintain current a detailed source inventory of point sources of emissions. An emission inventory specifies the (1) amounts, and (2) sources of air pollution in a community. The knowledge of air pollution can be relegated to three simple questions: (1) "What" the pollution problem is in terms of primary air pollutants, (2) the "where" of the problem -- i.e., a description of the industrial, commercial, or domestic sources by tabulation of either (a) types and location of basic equipment discharging pollutants, (b) a description in broad source categories of industry, or (c) actual tabulation of locations of plants in the community, and (3) the "how much" or extent of air pollutants. In the case of gases, namely organic compounds, the oxides of nitrogen and sulfur, and CO, future regulation and enforcement of invisible gaseous emissions requires an inventory which predetermines or estimates levels of emissions and directs enforcing officers or inspectors to point locations. This capability is discussed as well as the description of the method of construction of a recent source inventory, calculated on the basis of average emission factors and known plant throughput data and plant locations (registered plant equipment).##

00375

R. A. Prindle

AIR POLLUTION AND COMMUNITY HEALTH (CHAPTER EIGHTEEN). Medical Climatology 505-18, 1964.

In this chapter author reviews major pollution episodes which have occurred since 1930 in various parts of the world. These episodes have demonstrated the danger and the lethality that may result when certain meteorologic phenomena occur in geographical areas where potentially high concentrations of air pollutants may form. Certain pollutants that might be tolerated in low concentrations in some inhabited areas might become dangerous when mixed with pollutants from other sources that could exert an accentuating or synergistic action. SO2, particulates, CO, beryllium, lead, fluoride, photochemical, and allergenic pollutants and their effect on man and animals are discussed. The most important animal experiments as well as other research are reviewed.##

00454

J.M. Blum

(RADIOACTIVE POLLUTION IN GASEOUS MEDIA.) La pollution radioactive des milieux gazeux. Energie Nucl. (Paris) 8(2):141-3, Apr. 1966. Text in French

An annotated bibliography is given for various aspects of atmospheric radioactive pollution, including measurement methods, waste disposal and effects on humans.##

00464

C.F. Ellis

CHEMICAL ANALYSES OF AUTOMOBILE EXHAUST GASES FOR OXYGENATES. Bureau of Mines, Washington, D.C. (Rept. of Investigations No. 5822). 1961. 39 pp.

This report presents procedures for chemical analyses of certain oxygenated compounds, procedures for sampling the exhaust gases for these analyses, and the analytical results of some experimental work in which these procedures were used. A stationary 1956 model, 170 horsepower, V-8, dynamometer-mounted engine, operated to simulate vehicular cruise conditions, was used for the study. Exhaust gsees produced from a regular-grade Midcontinent gasoline during 15- , 40- , and 60-mile-per-hour cruise operations were analyzed by chemical methods for formaldehyde, total aldehydes, total carbonyls, total alcohols, carvon associated with the oxygenated compounds, and the oxides of nitrogen. Experimental results indicate: (1) The range of concentrations of the total of the functional groups of oxygenated compounds, expressed as moles per million moles of water-free exhaust gases, is about 90-100; the concentrations increase with engine speed; (2) Aldehydes comprise about 80-90 mole-percent of the total of the oxygenated groups, and formaldehyde accounts for about 50 mole-percent of the total aldehydes; (3) The order of magnitude of the concentration of the carbonyls is the same as that for the aldehydes, indicating that ketones are not a major group. A colorimetric test indicates that methyl ketones consititute about 2 mole-percent of the oxygenated compounds; (4) The concentration of the alcohols is of the order of 10 mole-percent of the oxygenated compounds; (5) The total carbon associated with the oxygenated compounds is about 175 moles per million moles of water-free exhaust gas for all 3 speeds; and (6) The concentration of N oxides, expressed as moles of NO2 per million moles of water-free exhaust gas, is about 150, 1,600, and 2,800 at 15, 40, and 60 miles per hour, respectively.##

00504

D.A. Jensen

SEPARATING FACT FROM FICTION IN AUTO SMOG CONTROL. Arch. Environ. Health, 14(1):150-155, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., March 2-4, 1966.)

Author gives a status state-of the -art summary of the various sources of emissions from automobiles. Topics covered are: crankcase emission controls; servicing and maintenance; requirement of a "closed" system or one equally effective, exhaust emission controls; evaporative emissions; oxides of nitrogen emission controls; diesel smoke and odor emission controls; cars and fuels of the future. In addition, author discusses the impending vehicle emission control which will be put into effect for 1968 motor vehicles.##

00539

H. Stephany

TYPE AND EMISSION QUANTITIES OF INDUSTRIAL AND DOMESTIC FLUE GASES AND VEHICLE EXHAUST GASES. (Art und Emissionsmengen von Industrie-, Hausbrand-und Kraftfahrzeug-Abgasen.) Erdoel Kohle (Hamburg) 19(6):457-461, June 1966.

Types of air pollution which occur in Germany are discussed. The Clean Air Committee of the Association of German Engineers is described. The committee's program and published regulations for the limitation of emissions are tabulated.##

00566

W. L. Faith

ECONOMICS OF MOTOR VEHICLES POLLUTION CONTROL. Chem. Eng. Progr., 62(10):41-43, Oct. 1966. (Presented before the Symposium on Economics of Air Pollution Control, 59th National Meeting, American Inst. of Chemical Engineers, Columbus, Ohio, May 15-18, 1966, Paper No. 24 G.)

The cost of air pollution control devices to the motorist, for the reduction of hydrocarbons, carbon monoxide and nitrogen oxides in general and per smog day, are discussed. Cost of the device, of the installation and cost of maintenance are calculated. Results are summarized in tables.##

00592

T. A. Huls, P. S. Myers, and O. A. Uyehara

SPARK IGNITION ENGINE OPERATION AND DESIGN FOR MINIMUM EXHAUST EMISSION. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, Society of Automotive Engineers, Inc., New York, 1966, p. 71-91. 28 refs. (Presented at the Society of Automotive Engineers Meeting, June 6-10, 1966.

The purpose of the tests conducted on a single-cylinder laboratory engine was to determine what can be done in the design and operation of a spark-ignition engine to minimize emission of air pollutants. For the engine used in this study, the exhaust emissions were found to have the following dependence on various engine variables. Hydrocarbon emission was reduced by lean operation, increased manifold pressure, retarded spark, increased exhaust temperature, increased coolant temperature, increased exhaust back pressure and decreased compression ratio. Carbon monoxide emission was affected by air-fuel ratio and premixing the charge. NO and NO2 emission is primarily a function of the O2 available and the peak temperature attained during the cycle. Decreased manifold pressure and retarded spark decrease NOx emission. Hydrocarbons were found to react to some extent in the exhaust port and exhaust system. This reaction appears to follow the Arrhenius rate equation relationship. Calculations of theoretical HC concentrations were made based on quench theory using measured combustion pressures and surface temperatures. It was assumed that the only source of HC's in the exhaust is the quench volume, i.e., the thin layer adjacent to the chamber walls through which the flame does not propagate. The difference between actually measured HC emission levels and the levels that quench theory predicts is resolved by assuming 2/3 of the contents of the quench volume leave the engine and Arrhenius type reaction during the exhaust portion of the combustion cycle. It was also concluded that the HC's left unburned after flame passage in the combustion chamber are proportional to the area swept by the flame per unit charge. (Authors' abstract)##

00650

M.C. Battigelli

EFFECTS OF DIESEL EXHAUST. Arch. Environ. Health Vol. 10(2)165-167, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

Over the past three years the author's work at the School of Public Health in Pittsburgh has been directed to the possible detrimental effects brought about through exposure to diesel motor exhaust. Attention was directed to railroad workers employed in locomotive repair shops. Neither respiratory complaints nor impaired pulmonary function, could be related to this type of occupational exposure. As a second phase in this investigation, volunteers were exposed to diesel exhaust gas for short periods and pulmonary resistance was measured. The levels utilized for these controlled exposures are comparable to realistic values such as those found in railroad shops. No effect could be measured in these volunteers after they had been exposed at these varying levels of pollution from diesel exhaust for short periods up to one hour.##

00673

H.H. Hovey, A. Wisman, J.F. Cunnans

THE DEVELOPMENT OF AIR CONTAMINANT EMISSION TABLES FOR NONPROCCESS EMISSIONS J. Air Pollution Control Assoc. Vol. 16(7):362-366, July 1966. (Presented at the 58th

Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-17.)

In New York State, the calculation of air contaminant emissions from a variety of sources is an essential part of comprehensive air pollution studies. The tables used to calculate emissions were obtained from an extensive literature search and modified to apply to New York State conditions. For example, sulfur dioxide emission factors for coal were selected to reflect the average sulfur content of the coal sold in New York State. Since the literature contains a wide array of emission factors,##

00679

W. E. Jackson

AIR POLLUTION FROM AUTOMOBILES IN PHILADELPHIA. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-137.).

This report has been prepared with the objectives of describing the problem created by automobiles in Philadelphia and recommending the action which must be taken. The action recommended is as follows: (1) Positive crankcase ventilation systems and exhaust control systems should be required on all new cars registered in Pennsylvania. A well planned program of controlling only the new cars with factory installed devices will minimize the problem over a ten year period. If initiated immediately, this reasonable approach would eliminate the need for a crash program at some future date. All mechanical devices require maintenance to insure proper and efficient operation; and (2) The State-wide inspectional system should require a maintenance check of all appropriate parts of the automobiles to insure satisfactory operation (as related to pollution emissions) and to reject those cars with visibly excessive exhaust emissions. This should apply to both new and used automobiles and all other types of motor vehicles.##

00693

G. Walker

EQUILIBRIUM DISTRIBUTION PATTERNS OF THE COMBUSTION PRODUCTS OF A GASOLINE ENGINE OPERATING ABOUT THE STOICHIOMETRIC CONDITION. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-18.)

The operation of a C.F.R. internal combustion engine was simulated on a digital electronic computer. A study was made of the effect of variation in the air-fuel ratio on the equilibrium distribution patterns of combustion products at the end of the expansion stroke. The combustion products were assumed to consist of 10 chemical species at instantaneous equilibrium during both the finite combustion period and subsequent expansion. The equilibrium composition of the 10 species throughout the whole period is presented graphically for six different air-fuel ratios both greater and less than the stoichiometric value. Other parameters of engine performance, including thermal efficiency, m.e.p., work done per cycle and the heat transferred, are given for the same air-fuel ratios.##

00798

R.I. Larsen

VEHICLE EMISSIONS AND EFFECTS, A SUMMARY OF THE DECEMBER 1961 AIR POLLUTION RESEARCH CONFERENCES. Preprint. (Presented at the New England Section Annual Meeting, Air Pollution Control Association, Worcester, Mass., Apr. 25, 1962).

In December 1961 air pollution research findings to that date were presented at two conferences held in Los Angeles. The conferences were the Fifth Air Pollution Medical Research Conference and the Joint Research Conference on Motor Vehicle Emissions and Their Effects. A few highlights follow. Air pollution damages plants, animals, and property, and is harmful to people. Plant damage in the United States exceeds $25 million per year. Present community air pollution levels weaken an individual's resistance to respiratory diseases such as colds, pneumonia, and lung cancer. Smoking and air pollution age and deteriorate lungs. In one study, smokers' lungs aged 50% faster than non-smokers' lungs. In another study, 90% of heavy smokers (more than two packs per day) had respiratory disease. The disease rate for several respiratory ills was 3 to 5 times greater in these heavy smokers than in individuals who had never smoked. The death rate from emphysema (deteriorated lungs) has increased 400% in the last 10 years. A recently identified photochemical pollutant, peroxyacyl nitrate (PAN), at concentrations as low as 5 parts per billion (ppb), damages plants. It is quite possible that this pollutant is responsible for most "oxidant-type" damage in Los Angeles. Five times as much exhaust gas from low-olefin fuel was required to produce similar damage. Russian air quality standards probably have at least one present use in the United States. In a given community, pollution concentrations that do not exceed the Russian standards tentatively could be considered to not be problems. The contribution of the internal combustion engine to smog could be reduced significantly by improved carburetor design, improved production control, and imporved carburetor and ignition system maintenance. If the conventional engine without an afterburner is considered beyond redemption, a lean-fuel engine (such as gas urbine, stratified charge, or diesel) could be used to meet present emission standards. If an automobile that does not contribute to smog is to be achieved, a new sense of mission, a lot more money, and additional competent researchers will be required. (Author abstract modified)##

00892

W.D. Norwood, D.E. Wisehart, C.A. Earl, F.E. Adley, D.E. Anderson

NITROGEN DIOXIDE POISONING DUE TO METAL-CUTTING WITH OXYACETYLENE TORCH. J. Occupational Med. 8(6):301-306, June 1966.

Several hours after the use of an acetylene torch for metal-cutting in a poorly ventilated water main, a worker became so short of breath that he could not sleep. He reported to the plant physician 18 hr. after the exposure and an X-ray film revealed pulmonary edema. Reenactment of the event produced a level of nitrogen dioxide of 90 ppm in 40 min., the total oxides of nitrogen being in excess of 300 ppm. Such a level might well be expected to produce pulmonary edema. The accident was typical of the insidious action of nitrogen dioxide, which can so easily occur under some conditions and may cause death. Recognition of the latent period between exposure and the development of pulmonary edema, timely treatment with bed rest, and, if necessary, the administration of oxygen under pressure can be life-saving. A greater awareness of the sources and toxicity of nitrogen dioxide is also needed to prevent unnecessary exposure. (Author summary)##

00962

R. I. Larsen

AIR POLLUTION FROM MOTOR VEHICLES. Ann. N. Y. Acad. Sci., 136(12):275-301, Aug. 26, 1966. (Presented at a meeting of the New York Academy of Sciences, April 6, 1966.)

Motor vehicles are a major source of urban air pollution. They emit carbon monoxide that reduces man's ability to transport oxygen to his tissues; lead that increases man's body burden of this toxic metal; cancerigenic hydrocarbons; and reactive hydrocarbons and nitrogen oxides that combine with sunlight to produce eye-irritating, plant-damaging, visibility-obscuring photochemical smog in New York as well as in California. Present and predicted air pollutant concentrations are compared with pollutant effects and air quality standards. Emission-reduction features presently used in new cars sold in California will improve air quality, but will not completely solve the problem. Indications are that 95 percent reduction in emissions of carbon monoxide, hydrocarbons, and nitrogen oxides from new cars sold in the United States may be needed by 1975. Such a "clean-air car" by 1975 is suggested as a research goal for automobile manufacturers. At present, improved fuel cells or improved battery power seem to be the most likely means for achieving this goal. (Author abstract)##

00969

P. A. Leighton

MAN AND AIR IN CALIFORNIA. Preprint. (Presented at the Statewide Conference on Man in California, 1980's, Sacramento, Calif., Jan. 27, 1964.)

Author discusses polluted air in respect to automobile emissions and projects the concentrations that can be expected by 1980. Presented are charts and tables which easily delineate the salient points of the article.##

00972

M. Mayer

A COMPILATION OF AIR POLLUTANT EMISSION FACTORS FOR COMBUSTION PROCESSES, GASOLINE EVAPORATION, AND SELECTED INDUSTRIAL PROCESSES. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution, May 1965, 53 p.

The source emission factors presented in this report were compiled primarily for use in conducting an air pollutant emission inventory. The compilation is the result of an extensive literature survey and includes emission factors for the principal combustion and industrial processes. Obviously, the best emission factor to use for any specific source of air pollution is that resulting from source tests of the specific source. Unfortunately, many urban areas are not equipped to conduct the numerous and expensive stack testing studies needed for an emission inventory. The purpose of this compilation of emission factors is to provide the best available substitute to air pollution control agencies unable to conduct extensive source test programs. In certain cases, particularly in the combustion and refuse disposal areas, a single number is presented for the emission factor for a specific pollutant. It should be understood that the number is usually a weighted average of several different values found in the listed references. The compilation of source emission factors presented is, in our judgment, the most accurate currently available. As new technical advances are made, however, and additional emission data become available in the literature, the present compilation should be revised to reflect the newer data and developments.##

00975

M. I. Weisburd, (Compiler and Ed.)

AIR POLLUTION CONTROL FIELD OPERATIONS MANUAL (A GUIDE FOR INSPECTION AND ENFORCEMENT). Public Health Service, Washington, D. C., Div. of Air Pollution, 1962. 291p.

Author discusses sources, control methods, training techniques and related aspects of air pollution. Document is an excellent source for specific information on equipment being used in air pollution control. Pictures, diagrams, schematics and charts are given.##

01002

E. S. Starkman, ~~H. K.~~ Newhall, R. Sutton, T. Maguire, and L. Farbar

AMMONIA AS A SPARK IGNITION ENGINE FUEL: THEORY AND APPLICATION. California Univ., Berkeley. (Presented at the Society of Automotive Engineers Congress, Detroit, Mich., Jan. 10-14, 1966, Paper No. 660155.)

Anhydrous ammonia has been demonstrated to operate successfully as a fuel for spark ignition engines. Principal requirements are that it be introduced in the vapor phase and partly decomposed to hydrogen and nitrogen. Spark timing for maximum performance must be advanced slightly for ammonia but sensitivity to spark timing is little greater than with hydrocarbons. Increasing the cylinder wall temperature aids in effecting successful and reliable operation. The maximum theoretically possible indicated output using ammonia vapor is about 77% of that with hydrocarbon. Specific fuel consumption increases twofold at maximum power and 2-1/2 fold at maximum economy when using ammonia as a replacement for hydrocarbon. (Author abstract) **

01076

E. F. Darley, F. R. Burleson, E. H. Mateer, J. T. Middleton, and V. P. Osterli

CONTRIBUTION OF BURNING OF AGRICULTURAL WASTES TO PHOTOCHEMICAL AIR POLLUTION. J. Air Pollution Control Assoc. Vol. 16(12):685-90, Dec. 1966. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966.)

Agricultural wastes from orchards, grain fields, and range lands are burned each year in California as the most practical means of ridding the land of these wastes. In order to determine the relative contribution of the burning of such material to photochemical air pollution, the effluent from 123 fires of known weights of range brush, both dry and green, barley and rice stubble, and prunings from various fruit and nut trees were monitored in a special tower which provided an open burning situation. Analyses were made for total hydrocarbon, expressed as C, by flame ionization detection, and for 24 individual hydrocarbons by gas chromatography, as well as for CO and CO2 by infrared spectroscopy. A few analyses were made for oxides of nitrogen. These data, coupled with temperature and airflow measurements, allowed calculations to be made on pounds of effluent per ton of material burned and demonstrated that the emissions from agricultural burning are much less than those from the automobile, a principal source of such emissions. (Author abstract) **

01125

D. Zanon and D. Sordelli

PRACTICAL SOLUTIONS OF AIR POLLUTION PROBLEMS FROM CHEMICAL PROCESSES . (Realizzazioni nel Campo della Prevenzione dell' inquinamento Atmosferico di Origine Industriale.) Translated from Italian. Chim. Ind. (Milan), 48(2):251-261, March 1966.

A strict control of pollutant to be dispersed in the atmosphere offers technical and economic problems, both in the design and the operation of chemical processing units. Three examples of processes for which pollution control has been established are described: SO2 derived from contact sulfuric acid and from hydroxylamine sulfate plants, nitrous gas from low and high-pressure nitric acid plants, and fluorine-containing effluents from hydrogen fluoride production. The general approach, kind of abatement process adopted, materials and construction costs are discussed.##

01165

H. R. Holland

AIR QUALITY CONTROL BY PETROLEUM REFINERS. Preprint. (Presented at the Third Annual Meeting, Pacific Northwest International Section, Air Pollution Control Association, Vancouver, British Columbia, Nov. 2-4, 1965.)

Air quality can best be maintained by controlling pollution on a regional basis. Close cooperation between the technical staffs of the province, municipalities and industries in the region is required to achieve the best solution to the regional problem. Means are available to control the emissions from petroleum refineries to the degree required by our current understanding of the problems.##

01228

L. Rispler and C. R. Ross

VENTILATION FOR ENGINE EXHAUST GASES. Occupational Health Rev. Ottawa 17, (4) 19-22, 1965.

Engine exhaust gases are capable of affecting health in varying degrees, and confusion as to their relative importance often arises. This is partly because most exhaust analyses are reported only as concentrations within the exhaust system, without specifying the total exhaust volume. For clarification, a comparison is made of the actual amounts in which these components are emitted from various engines. These data exemplify the difference in ventilation requirements for diesel engines and gasoline engines. The toxic effects of carbon monoxide and some basic ventilation considerations are outlined. (Author abstract)#
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01306

L. E. Reed and C. R. Barrett

AIR POLLUTION FROM ROAD TRAFFIC - MEASUREMENTS IN ARCHWAY ROAD, LONDON. Intern. J. Air Water Pollution, No. 9: 357-365, 1965.

Measurements of smoke near a busy main road in London showed concentrations (up to micro grams/cubic meter) ten to twenty times greater than those at a site about one hundred yards away from the road. These high concentrations are considered to be due to diesel vehicles. Correspondingly high values for sulphur dioxide and oxides of nitrogen at the roadside site are attributed to road traffic generally. (Author abstract)##

01362

E.K. Diehl E.A. Zawadzki

CONTAMINANTS IN FLUE GASES - AND METHODS FOR REMOVAL. Coal Age, Vol. 70:70-74, Dec. 1965. (Presented at Technical Sales Conference, National Coal Association and Annual Meeting of Bituminous Coal Research, Inc., Sept. 1965.)

The relative importance of the harmful pollutants in stack gases from coal combustion is described. Polynuclear hydrocarbons, ocides of nitrogen, particulates, and sulfur oxides are considered. Sulfur dioxide removal methods are described.##

01375

E.S. Starkman H.K. Newhall

CHARACTERISTICS OF THE EXPANSION OF REACTIVE GAS MIXTURES AS OCCURRING IN INTERNAL COMBUSTION ENGINE CYCLES. California Univ., Berkeley, Dept. of Mechanical Engineering, 1965, 13 p. (Presented at the Mid-Year Meeting, Society of Automotive Engineers, Chicago, Ill., May 17-21, 1965, Paper No. 650509.)

The influence of nonequilibrium in the expansion gases of spark ignition engines has been studied theoretically to determine how power output and exhaust gas composition might be affected. Comparing a gas which is frozen in composition during expansion with a composition which continuously is in equilibrium shows the difference in expansion work can be as large as 10%. Maximum influence is in the fuel-air ratio range of chemically correct mixture. It was found that carbon monoxide and nitric oxide concentrations in the exhaust more nearly reflect the frozen composition than the equilibrium expansion. This is particularly true for the range of mixture ratios - from lean to chemically correct.##

01377

R.G. Mastin

COMBUSTIBLES VERSUS NITROGEN FIXATION IN GAS ENGINE OPERATION AND LUBRICATION. J. Eng. Power, April 1965. p. 175-80. (Presented at the Oil and Gas Power Conference and Exhibit, Dallas, Tex., Apr. 12-16, 1964, of the American Society of Mechanical Engineers, Paper No. 64-OGP-4.)

Nitration is preferable to combustibles in the operation of the gas engine because it affects only the lubricating oil. Combustibles affect, in addition to lubricating oil, engine parts by the deposition of carbon, and cause expensive fuel waste. The data were gathered with the aid of an exhaust gas analyzer and a spectrophotometer. The gas engine should never be operated with combustibles in the exhaust gas. In many instances, the wasted fuel will equal the cost of several oil changes during the year. The naturally aspirated, 4-cycle, gas engine should not be operated with 2 to 3 percent excess oxygen content in the exhaust gases, in order that the peak incidence of NO2 may be avoided. R - O - NO2 was found in varying degrees in used oils from all types of gas engines. Deposits from the crankcase parts of gas engines contained R - O - NO2. Gas engine crankcase oils should not be used too long. The oil soluble R - O - NO2 compounds progress to the insoluble form. This form then appears to be the nucleus for the attraction of all foreign material present which forms the deposit. Fuller's earth filtration does not remove oil soluble R - O - NO2 compounds from the crankcase oil.##

01381

R.W. Hurn

COMPREHENSIVE ANALYSES OF AUTOMOTIVE EXHAUSTS. Arch. Environ. Health, Vol. 5:592-596, Dec. 1962. (Presented at the session on Constituents of Motor Vehicle Exhaust at the Air Pollution Research Conferences, Los Angeles, Calif., Dec. 5, 1961.)

The nature of the gaseous or volatilized components of automotive exhaust is reviewed. Recent work conducted to define more precisely variations in exhaust-gas stream composition is reported. Information on the simultaneous occurrences of the several classes of components is presented. Analytical methods; inert, reactive, and noxious constituents; and hydrocarbon measurements are considered.##

01382

R.W. Hurn, T.C. Davis

GAS CHROMATOGRAPHIC ANALYSIS SHOWS INFLUENCE OF FUEL ON COMPOSITION OF AUTOMOTIVE ENGINE EXHAUST. Proc. Am. Petrol. Inst. 38(3):353-375, 1958. (Presented at the 23rd Midyear Meeting, American Petroleum Institute's Division of Refining, Los Angeles, Calif., May 12, 1958.)

Chemical differences in the exhaust products from different fuels; and the effect of engine speed and load on these differences are reported. Experimental data were obtained with the use of a late model automotive V-8 engine on a dynamometer block. Fuels which were used included pure isooctane, commercial LPG (butane and propane, separately), and seven gasoline stocks from different refining processes. Analytical data obtained by gas chromatography show that exhaust composition varies with engine speed and load according to consistent trends. These trends are influenced by fuel composition, and the degree of fuel influence depends upon mode of engine operation--some basic fuel characteristics are more heavily reflected in the exhaust than are others. Generally, differences in the composition of exhausts from different fuels are quantitatively small, but they are reproducible. (Author abstract modified)##

01384

R.W. Hurn, C.L. Dozois, J.O. Chase, C.F. Ellis,
P.E. Ferrin

THE POTPOURRI THAT IS EXHAUST GAS. Proc. Am. Petrol. Inst., 42(3):657-664, 1962. (Presented at the 27th Midyear Meeting, American Petroleum Institute's Division of Refining, San Francisco, Calif., May 17, 1962.)

Information concerning the myriad compositions and hydrocarbon distributions that accompany changes in engine mode and that define the variable character of an exhaust gas stream is given. Data were obtained on exhaust gases produced using an engine dynamometer cycled through steady-state and transient modes to simulate demands on the engine in city traffic. Test procedures were designed to optimize reproducibility of the tests. Moreover, analyses were scheduled in a manner to permit determination of all components on the same or on comparable samples. Carbon hydrocarbons by major types, oxygen, oxides of nitrogen, and hydrocarbon-derived ocygenates were determined. Concentrations that were measured fell within a range of values that had been reported in the literature. However, the analyses are unique in that they provide information on the simultaneous, concurrent concentrations of materials that constitute the exhaust gas flow and on how these concentrations vary with steady-state and transient engine operation. The data also show the manner in which both absolute and relative distributions of hydrocarbon in the exhausts vary with change in engine mode. (Author abstract modified)##

01400

J. A. Maga

CONSIDERATIONS IN SETTING STANDARDS FOR OXIDES OF NITROGEN. J. Air Pollution Control Assoc., 15(12):561-564, Dec. 1965.

Since 1959 the California Department of Public Health has held responsibility for setting standards for ambient air quality for motor vehicle emissions. The need for standards for oxides of nitrogen involves consideration both of direct effects and effects resulting from participation in photochemical smog reactions. This paper discusses the various effects of concern and describes the department's program for establishing air quality standards which will become the basis for vehicle emission standards and serve as guides for control of other sources of oxides of nitrogen. (Author abstract)##

01404

R. P. Hangebrauck, R. P. Lauch, and J. E. Meeker

EMISSIONS OF POLYNUCLEAR HYDROCARBONS FROM AUTOMOBILES AND TRUCKS. Am. Ind. Hyg. Assoc. J., Vol. 27:47-56, Feb. 1966.

As part of a screening survey to determine the origin of the benzo(a)pyrene found in urban atmospheres in the United States, emission rates of several polynuclear hydrocarbons, including benzo(a)pyrene, were measured on several automobiles and trucks powered by gasoline engines. The vehicles were road-tested over typical driving routes. The total exhaust was sampled by passing it through a multi-plate condenser followed by large high efficiency filters. Operating and emission data are given. The combined effects of vehicle-model age and mileage on polynuclear emissions are discussed, as are the relationships between polynuclear hydrocarbon emissions and the emissions of other products of incomplete combustion. (Author abstract)##

01413

A. H. Rose, Jr., R. Smith, W. F. McMichael, and R. E. Kruse

COMPARISON OF AUTO EXHAUST EMISSIONS IN TWO MAJOR CITIES . J. Air Pollution Control Assoc. 15, (8) 362-6, Aug. 1965.

Direct measurement of emissions from vehicles operating under actual traffic conditions in Los Angeles, California, and Cincinnati, Ohio are presented. Exhaust emissions expressed as pounds of contaminant emitted per vehicle mile traveled are a function of average speed of the vehicles over the designated route (average route speed) regardless of the characteristics of the specific route and can be best shown as a logarithmic function of pounds of contaminant emitted per vehicle mile versus average route speed. Exhaust emissions expressed as concentration provide a less valid measurement of atmospheric contamination than emissions expressed as pounds per vehicle mile traveled. The reason is believed to be the variability in consumption of combustion air by vehicles and in characteristics of the test routes. The emission data expressed as a logarithmic function of pounds of contaminant emitted per vehicle mile versus average route speed show no significant differences between Los Angeles and Cincinnati. The effects of peak versus offpeak traffic on emissions expressed by weight are basically a function of the changes in average route speed. (Author summary modified)##

01482

S. T. Cuffe and R. W. Gerstle

EMISSIONS FROM COAL-FIRED POWER PLANTS: A COMPREHENSIVE SUMMARY. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control. (Presented at the American Industrial Hygiene Association Meeting, Houston, Tex., May 1965.) (PHS Publ. No. 999-AP-35.) 1967. 30 pp.

A series of tests on six coal-burning power plants has been conducted to determine certain stack gas components of interest in atmospheric pollution. The six units tested included three dry-bottom pulverized coal-burning units, two wet-bottom units, and a large spreader-stoker traveling-grate unit. Measurements of sulfur oxides indicate that essentially 90 to 100 percent of the sulfur in the coal appears as sulfur oxides in the stack gas. Of this amount 1 to 2 percent is in the form of sulfur trioxide and the balance is sulfur dioxide. Neither the type of furnace, the conditions of firing, nor the reinjection of fly ash affected sulfur oxide emissions significantly. Concentrations of sulfur oxides are thus essentially determined by the amount of sulfur in the coal entering the furnace. Concentrations of nitrogen oxiees varied widely, ranging from 221 ppm for the vertically fired unit to 1204 ppm for the cyclone-type furnace. Concentrations of nitrogen oxides apparently are determined by: (1) initial flame temperatures in the firebox, (2) decomposition in the high-temperature region of the furnace, and (3) quenching of the decomposition reaction as the gases are cooled in the boiler section of the furnace. Control of particulate emissions varied considerably in coal-fired power plants. Combination cyclone and electrostatic-precipitator-type fly-ash collectors gave collection efficiencies of about 96 percent and an outlet grain loading of 0.20 grain/scf at full load. Electrostatic precipitators and mechanical cyclone collectors, when used separately, gave average collection efficiencies ranging from 75 to 85 percent, with loadings at the fly-ash collector outlet varying from 0.19 to 0.68 grain/scf. Additional emissions determined included polynuclear hydrocarbons, carbon monoxide, gaseous hydrocarbons, formaldehyde, and trace metals. None of these components was found in appreciable quantities during normal furnace operating conditions. (Author summary)##

01484

AUTOMOTIVE AIR POLLUTION (A REPORT TO THE U.S. CONGRESS IN COMPLIANCE WITH PUBLIC LAW 88-206, THE CLEAN AIR ACT). Preprint. Dec. 1964.

Photochemical air pollution or smog is a problem of growing national importance and is attributable largely to the operation of the motor vehicle. Manifestations of this type of air pollution are appearing with increasing frequency and severity in metropolitan areas throughout the United States. Biological studies of animals show that the photochemical reaction products of automotive emissions produce adverse health effects. There is substantial evidence that these effects may appear in humans after extended exposure to air which is known to be polluted with these same products in many of the larger urban areas. Laboratory experiments have demonstrated that reductions of atmospheric hydrocarbons, an important emission from motor vehicles, can reduce photochemical air pollution and such manifestations as eye irritation and plant damage. Other automotive emissions such as nitrogen oxides and carbon monoxide have also been determined as significant. Nitrogen oxides, which appear in engine exhaust gases as well as the effluent of other combustion processes, also play an important role in photochemical air pollution. Technical procedures for reducing these emissions are not so clearly established as for hydrocarbons. Carbon monoxide, although not a contributor to atmospheric photochemical reactions, is a directly toxic substance. Technical procedures have been developed which substantially reduce emissions of this pollutant. The current problem and progress in its resolution are reported. (Author summary modified)##

01488

Ludwig, J. H.

SEMINAR ON AIR POLLUTION BY MOTOR VEHICLES. Technology Research and Development Programs, Washington, D.C. ((54))p., 1968. 1 ref.

The contribution of motor vehicle emissions to community-wide air pollution levels; emissions from gasoline and diesel engines; and photochemical reactions in the atmosphere are reviewed.##

01508

J. O. Ledbetter

AIR POLLUTION FROM WASTE WATER TREATMENT. Water Sewage Works 113(2):43-45, Feb. 1966.

There is air pollution from the treatment of wastewaters. This pollution involves not only the notorious odors and the recognized volatiles but also the aerosol emissions. The aerosols of most interest are probably the bacteria. Significant numbers of bacteria, including some pathogens, are emitted from activated sludge and trickling filter units. The methods of engineering control currently available can readily solve the problem. Even better solutions will likely be forthcoming if the problem ever warrants considerable research.##

01534

H. Wozniczek

AIR POLLUTION BY MOTOR CAR EXHAUST GASES) ZATRUCIE Powietrza Przez Spaling Samochodowe. Ochrona Pracy (Warsaw), 21(5):14-17, May 1966.

Pollution of towns and cities by automotive emissions is described. Chemical analyses of the various constituents of exhaust gases are given. Toxicity of these constituents is discussed.##

01546

J.J. Hanks H.D. Kube

INDUSTRY ACTION TO COMBAT POLLUTION. Harvard Bus. Rev., 44(5):49-62, Oct. 1966.

The responsibilities of individual corporations in air pollution abatement are emphasized. Sources of pollution discussed include the paper, steel, electric power, transportation and petroleum industries. Principal equipment for removal of aerosols and particulates is described. It is concluded that although air pollution equipment increases costs in certain industries, recovery of pollutant, such as fly ash, may help to offset the costs. Government activities in air pollution programs are summarized.##

01565

E. S. Starkman

ENGINE GENERATED AIR POLLUTION - A STUDY OF SOURCE AND SEVERITY. Preprint. (Presented at the Federal International

Societes Ingeneures Techniques De L'Automobile, Germany, June 15, 1966.)

A brief comprehensive view of the state of knowledge, legislation, research and application of devices to control the influence of reciprocating engine emissions on man and his environment is presented from the viewpoint and experiences of a California observer. The pollutants considered are: unburned hydrocarbons; carbon monoxide; oxides of nitrogen; carcinogens; particulate matter; lead; odor; and oxides of sulfur. Engine operating modes and severity of emissions; engine factors and emissions; and legislative control of emissions are considered.##

01568

THE OXIDES OF NITROGEN AND THEIR FORMATION (CHAPTER I OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation. Jan. 1966. 1-6 pp.

Chapter briefly describes the chemical and physical properties of the oxides of nitrogen. Mention is made of the role the nitrogen oxides play in automotive air pollution (this facet is more deeply covered in subsequent chapters). Three graphs are presented: (1) effect of spark timing on oxides of nitrogen concentration; (2) effect of compression ratio on oxides of nitrogen concentration; (3) effect of manifold air pressure on oxides of nitrogen concentration.##

01569

OXIDES OF NITROGEN FROM MOTOR VEHICLES (CHAPTER II OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation, p. 7-17, Jan. 1966.

Chapter deals with nitrogen oxide pollution (Source automobile) surveyed under varying conditions. Tests were performed at various accelerations, automatic versus manual transmissions, foreign vehicles versus domestic automobiles, and light trucks as a source. Data is statistically presented with means, standard deviations from the mean, and a mathematical formula to calculate the concentration of the nitrogen oxides.##

01570

OXIDES OF NITROGEN FROM STATIONARY SOURCES (CHAPTER III OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation. p. 19-20. Jan. 1966.

Sources of nitrogen oxide pollution are categorized into three divisions i.e., small sources - those emitting nitrogen oxides at a rate less than five pounds per hour; median sources - those emitting nitrogen oxides at a rate between five to one hundred pounds per hour; large sources - those emitting nitrogen oxides at a rate greater than one hundred pounds per hour. A chart is presented depicting these sources of nitrogen oxide pollution (both summer & winter) for the San Diego, Bay Area, Los Angeles, Sacramento, and Riverside communities of California.##

01571

INCREASES IN OXIDES OF NITROGEN EMISSIONS (CHAPTER IV OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation, p. 21-32. Jan. 1966.

Article elucidates the effects of population growth and the subsequent increase in motor vehicles registrations which will lend themselves to future nitrogen oxide pollution. Statistics are given for projected increases until 1980 (California) with an emphasis on the fuel consumption increases that will occur because of this population (motor vehicle registration) upswing.##

01572

OXIDES OF NITROGEN IN THE ATMOSPHERE (CHAPTER V OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation, p. 33-51. Jan. 1966.

This article discusses the air monitoring systems in California which detect the concentrations of nitrogen oxides. Concentrations are given for hourly, daily, monthly and seasonal variations. Statistics are also stated for hydrocarbon emissions but not in as much detail as for the oxides of nitrogen.##

01573

COLOR EFFECTS OF NITROGEN KIOXIDE IN THE ATMOSPHERE (CHAPTER VI OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation. p. 53-63, Jan. 1966.

The coloration effect of NO2 in the atmosphere depends on NO2 concentration, viewing distance, and aerosol concentration. The effect of 0.5 ppm NO2, with a viewing distance of 10 miles, is postulated to be acceptable on days of 10 mile visibility. In an aerosol-free atmosphere, with the same viewing distance of 10 miles, the acceptable NO2 concentration is about 0.1 ppm. In reality, an aerosol-free atmosphere does not occur in metropolitan areas, and a visibility of 20 miles would represent a reasonable goal for atmospheric clarity. On such days, the acceptable NO2 concentration would be about 0.25 ppm. (Author summary)##

01574

PHYTOTOXICITY OF NITROGEN DIOXIDE (CHAPTER VII OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation. p. 65-67. Jan. 1966.

A brief resume of the effects nitrogen dioxide has on plant species is presented. The conclusion is that concentrations in excess of 2-2.5 ppm are necessary to cause appreciable plant damage.##

01575

PHOTOCHEMICAL EFFECTS OF NITROGEN OXIDES (CHAPER VIII OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation. p. 69-89, Jan. 1966.

The chemistry of the photochemical reaction is reviewed, with emphasis on the role of nitrogen oxides. It is concluded that quantitative predictions cannot be made about the changes in the photochemical smog effects that would result from various degrees of control of either hydrocarbons or nitrogen oxides from motor vehicles.##

01576

BIOLOGIC EFFECTS OF NITROGEN DIOXIDE (CHAPTER IX OF THE OXIDES OF NITROGEN IN AIR POLLUTION). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation. p. 91-112 Jan. 1966.

Article reviews the toxic effects that nitrogen dioxide has on man and animal. A chart specifying the concentration (ppm) of nitrogen dioxide, the effects on man and lower animals, and a reference for this data is presented. The concentration range is 0.05 ppm to 500 ppm.##

01582

R.W. Gerstle D.A. Kemnitz

ATMOSPHERIC EMISSIONS FROM OPEN BURNING. J. Air Pollution Control Assoc. 17 (5), 324-7 (May 1967). (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper No. 67-135.)

Open burning of municipal refuse, of landscape refuse, and of automobile components was simulated. Carbon monoxide emissions were: 85 pounds per ton of material burned when municipal refuse was burned, 65 pounds per ton when landscape refuse was burned, and 125 pounds per ton when auto components were burned. These values are all very high when compared to emissions from municipal incinerators or other combustion processes. Gaseous hydrocarbon emissions paralleled the carbon monoxide concentrations and averaged 30 pounds per ton of material burned for all tests. The organic acid concentrations were also fairly high, averaging about 15 pounds per ton of material originally present in all tests. Formaldehyde concentrations varied from 0.095 pound per ton for municipal refuse to as low as 0.006 pound per ton for the landscape refuse. These formaldehyde concentrations also exceed those normally found in incinerators. Emissions of nitrogen oxides varied widely and depended on the intensity of burning. Highest values occurred during the initial burning period when temperatures were high. After the initial intense burning period of about 10 minutes, the nitrogen oxides concentrations dropped off rapidly. Particulate emissions averaged 16 pounds per ton of material burned when municipal refuse was burned and 17 pounds per ton when landscape refuse was burned. Emissions jumped to 100 pounds per ton when auto components were burned. Emissions of polynuclear hydrocarbons were also quite high, but for municipal or landscape refuse they were comparable to emissions from small commercial incinerators. For auto components, the concentrations were very high, comparable to those found in emissions from small coal-burning furnaces. (Author summary modified)##

01583

R.W. Gerstle R.F. Peterson

ATMOSPHERIC EMISSIONS FROM NITRIC ACID MANUFACTURING PROCESSES - A COMPREHENSIVE SUMMARY. Preprint. (For Presentation at the American Inst. of Chemical Engineers, Detroit, Mich., Dec. 8, 1966.)

Atmospheric emissions from nitric acid plants depend on plant operating conditions, production rates, and the use of control devices. Data in this article show that plants operating within design capacities and producing 55-60% nitric acid can limit the nitrogen oxides concentration to 0.3% in the stream leaving the absorption tower. This is equivalent to about 50 pounds of nitrogen oxides per ton of nitric acid (100% basis) produced. Installation of scrubbers or catalytic reduction equipment can reduce these emissions by 50 to 97%. Emissions during startup or shutdown usually do not create any special problems. (Author summary modified)##

01620

THE PETROLEUM REFINING INDUSTRY - AIR POLLUTION PROBLEMS AND CONTROL METHODS (INFORMATIVE REPT. NO. 1). J. Air Pollution Control Assoc. 14, (1) 30-3, Jan. 1964. (TI-3 Petroleum Committee).

Possible air-borne contaminants from refining operations are covered. Control methods for gaseous and particulate emissions, and the industry's research projects are reviewed.##

01624

D.A. Jensen

SOURCES AND KINDS OF CONTAMINANTS FROM MOTOR VEHICLES (INFORMATIVE REPT. NO. 4). J. Air Pollution Control Assoc. 14, (8) 327-8, Aug. 1964. (TA-10 Vehicular Exhaust Committee).

The sources of the pollutants, the important compounds, and the magnitude of the several contaminant sources from both gasoline and diesel powered motor vehicles are indicated.##

01626

C. H. Pesterfield

LITERATURE AND RESEARCH SURVEY TO DETERMINE NECESSITY AND FEASIBILITY OF AIR POLLUTION RESEARCH PROJECT ON COMBUSTION OF COMMERCIALLY AVAILABLE FUEL OILS. J. Air Pollution Control Assoc. 14, (6) 203-7, June 1964. (TA-4 Committee, Oil Burner Equipment.)

The basic purpose of this preliminary survey was to determine: (a) whether the combustion of fuel oil presented a serious air pollution problem by nature of its being a serious pollutant contributor; (b) what work has been done to evaluate its pollution contribution; (c) what work is being done; (d) what needs to be done; (e) if there is need and justification for a fuel oil combustion study.##

01654

A.C. Stern

THE REGULATION OF AIR POLLUTION FROM POWER PLANTS IN THE UNITED STATES. Rev. Soc. Roy. Belge Ingrs. Ind., Brussels (Presented at the International Symposium on Immission Regulations, sponsored by the Haus der Technik E.W. Essen and the Arbeits -und Sozialministerium (Dept. of Labor and Social Welfare) of North-Rhine-Westfalia, Essen, Germany Mar. 9, 1966; and before the Societe Royale Belge des Igenieurs et des Industriels, Brussels, Belgium, Mar. 16, 1966.)

Author discusses the types, concentrations, and levels of control (state, federal and local) that the United States has initiated for the abatement of air pollution from power generating sources. Statistics are presented for various localities as well as specific pollutants which are emitted. The Clean Air Acts (88-206 and 89-272) as they apply to the abatement of air pollution are explained.##

01673

C.J. Conlee, P.A. Kenline, R.L. Cummins, V.J. Konopinski

MOTOR VEHICLE EXHAUST STUDIES AT THREE SELECTED SITES. Arch. Environ. Health 14, (3) 429-46, Mar. 1967.

Air quality was studied in relation to motor vehicle densities at three selected sites: the Sumner Tunnel between Boston and East Boston, Massachusetts; the International Peace Bridge across the upper Niagara River between Fort Erie, Ontario, and Buffalo, New York; and Laidlaw Avenue near the Air Pollution Research Facility in Cincinnati, Ohio. Pollutant concentrations and meteorological findings are presented for each site. Concentrations of pollutants known to be associated with auto exhaust were greater at sites of higher traffic density. A comparison or particulate pollution levels at the Sumner Tunnel operated as a one-way tube in 1963 with the tunnel carrying two-way traffic in 1961, indicates a definite decrease in pollutant levels. Other pollutants were assumed to be dispersed in air in the same way as carbon monoxide in determing the contribution by motor vehicles to ambient air for the Sumner Tunnel. Auto exhaust appears to be a prime contributor (greater than 50%) for carbon monoxide, aliphatic aldehydes, benzene-soluble particulate, and oxides of nitrogen. Lead, benzo(g,h,i)pyrene, and coronene may also be assumed to be important pollutants from auto exhaust, but they do not meet the requirements for contribution calculations. (Author abstract)##

01687

S.C. Rothman

ENGINEERING CONTROL OF INDUSTRIAL AIR POLLUTION: STATE OF THE ART, 1966. Heating, Piping, Air Conditioning Mar. 1966. 141-8 pp. (Presented before the First World Air Pollution Congress, Buenos Aires, Argentina, Nov. 1965.)

Problems encountered by the engineer are illustrated through analysis of air pollution control in the aluminum production industry. Prebaked pots and Soderburg pots and their fluoride emissions are considered.##

01740

K. Grosskopf

THE PROBLEM OF PROVIDING ADEQUATE VENTILATION AT THE POINT OF WORK DURING GAS AND ARC WELDING. Zum Problem der Ausreichenden Beluftung des Arbeitsplatzes bein Gas- und Lichtbogenschweissen. Schweissen Schneiden (Duesseldorf) 18, (7) 323-5, July 1966.

Safety regulations governing welding require that adequate ventilation should be provided at the point of work. This rather unprecise formula can be clarified by localizing one of the gases cahracteristic to the welding process concerned, taking into account in each case the permissible MAK value. In the case of gas welding and open arc welding with coated electrodes the gas recommended is a nitrous gas, for plasma welding and TIG and MIG welding it is ozone. If CO2 is used for welding then special attention must be paid to the carbon monoxide content in the room atmosphere. The controls can be carried out in a simple manner through the use of suitable detector tubes. (Author summary)##

01741

E. Mastromatteo

HEALTH ASPECTS IN FIRE FIGHTING (PART 1). Firemen 33, (6) 20-1, Aug. 1966.

In the course of their work, fire fighters are exposed to a variety of toxic fire gases and other adverse health factors. Quite often they are required to enter buildings, confined spaces, and other places where they may be exposed to extremes of heat, to smoke, to oxygen lack, and to toxic gases created by the combustion process. The physical exertion, excitement and anxiety involved in many fire situations add to the health problems by increasing the breathing and heart rates. Fire fighting therefore can place severe demands on the respiratory, cardio-vascular and nervous systems. Some of the chief health hazards encountered in fire fighting are discussed. Reference is also made to a special study of heart and lung disease in fire fighters. (Author summary)##

01788

R.P. Hangebrauck, D.J. Von Lehmden, J.E. Meeker

EMISSIONS OF POLYNUCLEAR HYDROCARBONS AND POLLUTANTS FROM HEAT-GENERATION AND INCINERATION PROCESSES. J. Air Pollution Control Assoc. 14, (7) 267-78, July 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit Mich., June 11, 1963.)

This paper presents emission data from a series of tests, for which the sources tested included typical combustion processes involving the burning of conventional fuels (coal, oil, and gas) and of certain commercial and municipal solid wastes. In addition to obtaining over-all emission data from different sizes and types of combustion units, a primary objective of the study was to establish the relative importance of various combustion processes as contributors of benzo(a)pyrene (3,4 benzpyrene) and other polynuclear hydrocarbons with demonstrated or potential carcinogenic properties. The other pollutants measured included particulate matter, carbon monoxide, total gaseous hydrocarbons, oxides of nitrogen, oxides of sulfur, and formaldehyde. Two categories of c/mbustion sources were tested. Those burning conventional fuels were designated as heat-generation processes, and those burning waste materials were classed as incineration processes. Design and operation data for the units studied are given in tables.##

01837

W. F. McMichael and A. H. Rose, Jr.

A COMPARISON OF AUTOMOTIVE EMISSIONS IN CITIES AT LOW AND HIGH

ALTITUDES. Preprint. (Presented at the 58th Annual 7eeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper 65-22.)

Automobile exhaust emissions were studied in Denver, Colorado. Denver is unique among large cities in the United States in that it is situated at an altitude of approximately 5,000 feet; the opportunity was thus provided for observing the effects of altitude on auto exhaust emissions. The emissions measured in Denver in 1963 are compared with the emissions obtained in a similar, previously reported study in Los Angeles, California, and Cincinnati, Ohio. The survey techniques and the instrumentation used to colect and analyze the exhaust samples were the same. Emission measurements were made on test vehicles driven under actual traffic conditions while equipped with a proportional sampler. This method produces data that reflect the effects of traffic density, route, climate, and altitude.##

01842

D. F. Walters and D. O. Martin

AN EVALUATION OF THE AIR POLLUTION ASPECTS OF THE PROPOSED STEAM-ELECTRIC PLANT AT OAK PARK, MINNESOTA. Preprint. 1965.

The installation and operation of the 550,000 kilowatt steam-electric plant at Oak Park, Minnesota, will generate large quantities of air pollutants, principally sulfur dioxide, nitrogen oxides, and particulate matter. A 785-foot stack will be installed to permit dispersion and dilution of gaseous pollutants. Calculations indicate that ground level concentration of sulfur dioxide may cause acute damage to vegetation. However, existing information is inadequate to predict with assurance whether long-term chronic effects will be experienced by long-lived vegetation such as trees. It is expected that the human perception threshold for SO2 will be exceeded occasionally. Inversion breakup fumigation may produce ground level concentrations exceeding the human perception threshold at distances of ten miles or more. The installation and operation of a second unit of 750,000 kilowatt capacity will more than double air pollution emissions. If the 550,000 kilowatt unit is built and operated, a SO2 monitoring network should be activated. This will assist in determining the effects of SO2 on the surrounding vegetation and people, as well as provide guides for future installation design. Prevailing winds in this area are such that air pollutants will often be carried into Wisconsin. Therefore, officials of that State should take part in air pollution activities connected with the proposed plant. Plans and studies should be started now to obviate future air pollution problems indicated by plans for expansion of this plant beyond the initial 550,000 kilowatt capacity.##

01848

A. H. Rose

SUMMARY REPORT OF VEHICULAR EMISSIONS AND THEIR CONTROL. Preprint. (Presented at the Winter Annual Meeting, American Society of Mechanical Engineers, Chicago, Ill., Nov. 1965.)

The report summarizes average emissions from the four sources of contaminants in the present day automobile: the exhaust, the crankcase, the fuel tank, and the carburetor. Levels of contaminants presented are for emissions under average urban driving conditions, in contrast to earlier work in which values were based on cyclic dynamometer tests. Emission levels are expressed as pounds per day emitted and, where applicable, as concentration. Emissions are considered by general chemical classes to indicate the relative photochemical reactivities of compounds from each of the four sources. Control approaches are briefly discussed. (Author abstract)##

01863

AUTOMOTIVE AIR POLLUTION; (SECOND REPORT OF THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE TO THE U.S. CONGRESS PURSUANT TO PUBLIC LAW 88-206 - THE CLEAN AIR ACT.) 89th Congress (1st Session (Document 42) July 15, 1965. 17 pp.

Progress is reported on the resolution of the following problems: exhaust emissions, crankcase emission, fuel evaporative losses, maintenance, fuel, and diesels. The relevant literature is reviewed.##

01868

AUTOMOTIVE AIR POLLUTION. (THIRD REPORT OF THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE TO THE U.S. CONGRESS PURSUANT TO PUBLIC LAW 88-206 - THE CLEAN AIR ACT.) 89th Congress (2nd Session) (Document 83) Mar. 25, 1966. 17 pp.

Reduced exhaust emissions of hydrocarbons and carbon monoxide have become a reality in California with the introduction of the 1966-model passenger cars and light commercial vehicles. Recognition of the need for still further control measures is evidenced by the adoption of nitrogen oxide standards by the California Board of Health. The Department of Health, Education, and Welfare is implementing the new responsibilities and authories conferred by the Motor Vehicle Air Pollution Control Act. Standards for the control of emissions from gasoline-fueled vehicles are being deveoped accordingly, to become effective with the 1968 models. Some additional technical information has become available. Further studies of the effect of ambient temperature on exhaust emissions indicate that low temperatures tend to increase exhaust hydrocarbons and carbon monoxide, particularly following cold engine starts. Preliminary results obtained from a study of the effect of leaded fuels indicate that combustion chamber deposits may not significantly affect the quantities of hydrocarbons and carbon monoxide emitted in exhaust gases. A survey conducted to measure carbon monoxide levels in urban communities suggests that human exposure to carbon monoxide may be greater than routine atmospheric monitoring data had indicated. A number of new projects are being initiated by the Government to study the performance characteristics of production-type exhaust emission controls in varied environments, to develop more definitive data on exhaust emissions from small cars and diesel-powered vehicles, to learn more about human tolerance of lead and carbon monoxide, and to effect control of oxides of nitrogen. An expansion of industry research in automotive air pollution and its control is indicated by the recent activities of technical associations. (Author summary)##

01890

Williams, J. D., G. Ozolins, J. W. Sadler, and J. R. Farmer

INTERSTATE AIR POLLUTION STUDY: PHASE II PROJECT REPORT. VIII. A PROPOSAL FOR AN AIR RESOURCE MANAGEMENT PROGRAM. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 132p., May 1967. 7 refs

This report is devoted to the development of an air use plan for the St. Louis metropolitan area. An air use plan may be thought of as a link between the potential pollutant emissions of a community and the air quality goals. Its function is to optimize the use of the air with respect to the amount of pollutants emitted, by considering the dilution capacity of the air basin and the configuration of the pollutant sources in the area. The air use plan may then be used as the basic framework for achieving the desired air quality by the various means available such as limiting the emissions from individual sources, limiting the emissions from sources in certain areas, or even disallowing new pollution sources in overburdened areas. In short, it provides the basis for enacting control regulations and provides a guide for future planning activities.##

01921

V.G. MacKenzie

AIR POLLUTION AND THE COAL INDUSTRY. Preprint. (Presented at the Annual Meeting, National Coal Association, Chicago, Ill., June 15, 1965.)

The important aspects of the total air pollution problem which relates to the production, processing, and use of coal are discussed. The use of coal as fuel is of primary concern in the control of air pollution. Combustion of coal in homes, commercial enterprises, manufacturing, and electric power generating stations produce large quantities of pollutants, notably particulate matter and oxides of sulfur and nitrogen. Techniques for removal of SO2 from stack gases, which are under development in this country and abroad, offer great promise of control, when applied to very large fuel burning installations, such as steam electric generating plants. In regard to NO, the amount formed from the combustion of coal is an exponential function of the quality of coal burned per unit time. The

Clean Air Act made possible increased Federal support of control activities which are specified in the provision for air pollution abatement. This abatement authority is intended to supplement the abatement power of State and local governments with respect to inter-and intra State pollution problems. Lanother program of the Federal government is to provide guidance in the develoment of SO standards, relating to pollutant emissions, including those from fuel combustion, also at Federal facilities.##

01928

J. Nilsen

AIR POLLUTION: COSTLY TO IGNORE, COSTLY TO CONTROL. Chem. ENG. 73, (15) 90-6, JULY 18, 1966.

Author discusses the ramifications that will result from the recent legislation dealing with air pollution control. The parameters of the pollutants per se, the role of industries responsible for the pollution, the problems of the municipalities which must cope with the pollution problem, the effects of standards and legislation, the eventual cost of pollution control and the research programs to be undertaken are discussed. Also included is a chart of forty-eight major United States cities and the concentrations (ppm) of nitrogen dioxide and sulfur dioxide which were found to be present.##

01941

M. B. Jacobs

HEALTH ASPECTS OF AIR POLLUTION FROM INCINERATORS. Proc. Natl. Incinerator Conf., New York, 1964. pp. 128-31.

The public health aspects of incinerator exhaust gases are discussed first in the light of the physiological response induced by specific contaminants such as sulfur oxides, nitrogen oxides, and other inorganic gases and aldehydes, organic acids, esters, polynuclear hydrocarbons, and other organic compounds; second, with respect to their relation to illness caused by air pollution in general such as emphysema and other respiratory diseases, allergenic responses, and cancer; and third on the character of the effluent gases, namely domestic, municipal, or industrial. One aspect of domestic incinerator effluents is particularly stressed, that is, the effect on nearby residents. The contribution that incinerator exhaust gases make to the air pollution of any given community depends on the ratio of the amount of refuse and garbage burned to the total amount of fuel used and consumed in that region.##

01958

P. W. Leach, L. J. Leng, T. A. Bellar, J. E. Sigsby, Jr., and A. P. Altshuller

EFFECTS OF NC/NOX RATIOS ON IRRADIATED AUTO EXHAUST, PART II.

J. Air Pollution Control Assoc. 14, (5) 176-83, May 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 11-13, 1963.)

The relative concentrations of individual hydrocarbons have been shown to be independent of autoexhaust concentration in dynamic irradiation experiments. The absolute concentrations of the individual hydrocarbons are linearly related to total hydrocarbon concentration. The decrease in the concentration of reactive hydrocarbons during irradiation is found to be independent of whether a 120- or a 180-minute average irradiation time is used. A fourfold reduction in initial hydrocarbon concentration at constant hydrocarbon to nitrogen oxide level causes a slight increase in the relative amounts (percent) of hydrocarbon consumed during irradiation. The same fourfold reduction in initial hydrocarbon concentration at constant nitric oxide level results in a decrease in the percent of olefins reacted, but does not affect the percent of aromatics reacted. If the hydrocarbon level is kept constant, while the nitrogen oxide level is varied, an increase in nitrogen oxides causes a marked reduction in the percent of olefinic and aromatic hydrocarbons reacted during irradiation. The aldehyde yields are linearly related to the total hydrocarbon level. No significant effect on aldehyde yields was found when the average irradiation time was varied from 120 to 180 minutes. The aldehyde yields did vary with a decrease in yield both at very high and very low ratios of hydrocarbon to nitrogen oxide. The individual hydrocarbon and aldehyde concentrations are shown to fall well within the range of atmospheric concentrations. Although the aldehydes may be responsible in part for the eye irritation, the presence of other eye-irritating species must be postulated to explain the shape of the eye-irritation response curves when plotted against nitrogen oxide concentration.##

02001

B. Gills E.I. Howe

OIL BURNERS FOR DOMESTIC APPLICATION: PRESENT DESIGN AND FUTURE DEVELOPMENTS. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper III/2.) pp. 37-44.

Published work from various research organizations in Europe and the U.S.A. concerning malfunctioning of domestic pressure jet burners is reviewed. It is shown that when poor combustion performance of pressure jet burners is experienced the cause can be traced to one, or a combination of the following factors: 1. Poor design of the air/fuel mixing system. 2. Bad maintenance. 3. Bad matching of the burner characteristics to the heating appliance requirements. Bad performance of any combustion system is reflected in the composition of the final exhaust products. Results are presented which show that a combustion system can generally be operated so that it products no smoke, carbon monoxide or unburnt hydrocarbons. Due to attention which has recently been drawn to "exhaust odor" from oil-fired appliances reference is made to methods of measuring the total hydrocarbon content of flue gases. Recent developments with the objective of impo
developments with the objective of improving the combustion performance and reliability of domestic oil burners are described, together with references to research into methods of distillate

fuel atomization and combustion using novel principles. (Author abstract modified)**

02017

M.A. Termeulen

AIR POLLUTION CONTROL BY OIL REFINERIES. Proc. (Part I) Intern. Clean Air Cong., London, 1966 (Paper IV/5). pp. 92-5.

Stichting CONCAWE has been established by the Oil Companies' International Study Group for Clean Air and Water Conservation (Western Europe). Its Working Group on Atmospheric Dispersion is active in the field of abatement and control of air pollution originating from both domestic and industrial complexes. Major air-borne contaminations, from oil refining operation but not petrochemical operations, such a hydrocarbons, mercaptans, carbon monoxide, hydrogen sulphide and sulphur oxides other than from refinery flue gas, are discussed. Most common sources of the above contaminants are discussed, together with the general refinery practices for preventing or reducing emission of these contaminants. The effectiveness of modern refinery processes in reducing air pollution is reviewed and examples of local conditions and the way they affect the setting of practical limits of emissions are discussed. In conclusion, the general oil industries views with respect to the air pollution problem are summarized. (Author abstract modified)**

02056

I. L. Varchavski.

SOME THEORETICAL PROBLEMS OF PROVIDING LESS TOXIC OPERATION OF AUTOMOBILE ENGINES. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper VI/29). 292 pp.

The parameter of specific toxicity was introduced in 1962 to evaluate the degree of air poisoning caused by an engine. It is similar to the specific fuel consumption. The optimal regulation of an engine for less toxicity may be found. The specific toxicity is considered as a function of operating condition and parameters of adjustment. Intensification of ignition is estimated to provide stable operation at weak air fuel mixtures. This rapidly decreases the concentration of carbon and nitrogen oxides in the exhaust gases. Combined converters for diesel engines completely remove soot from the exhaust gases. Only fuel cells completely oxidize the fuel and so seem to be more promising for transport purposes.**

02066

W. Breuer, and K. Winkler.

SOURCES AND DISTRIBUTION OF AIR POLLUTIONS ASCERTAINED BY STATIONARY RECORDING OF GASEOUS COMPONENTS. Herkunft Und

Ausbreitung Von Luftverunreinigungen, Ermittelt Durch Stationare Registrierung Mehrerer Immissionskomponenten. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper VII/10). pp. 239-42.

Simultaneous, continuous and stationary measurement of the concentration of gas components (CO, CO2, SO2, H2S, C12, nitrous gases, hydrocarbons) combined with the recording of meteorological factors (wind direction, speed of wind, atmospheric stability etc.) enable the identifying of the source of air pollutions (motor vehicle exhaust, domestic heating, power stations, chemical works). The examination of special air conditions and statistical evaluation gives information on the process of distribution. (Author abstract)##

02148

T. Taga

(NO2 GAS GENERATED IN THE COMBUSTION CHAMBER OF COAL BURNING BOILERS.) Clean Air Heat Management (Tokyo) 15 (4), 5-9 (Apr. 1966). Jap. (Translated as JPRS-R-8588-D.)

The author emphasizes the importance of NO2 in air pollution and urges that as much effort should be exerted in abating pollution due to this gas as to SO2 or SO3 which are currently under extensive study. The paper describes the experimental study done by the U.S. Bureau of Mines, and discusses the results of a similar study by the author.##

02153

C. A. Rogus.

CONTROL OF AIR POLLUTION AND WASTE HEAT RECOVERY FROM INCINERATION. PUBLIC WORKS 97, (6) 100-3, JUNE 1966.

Europe has had for some time rigid government standards controlling air pollution with many large scale air pollution control installations, particularly of refuse incineration facilities. The nature of air pollutants from refuse incineration is discussed. The chemical analysis of fly ash is given as well as the size distribution of stack dust emissions. Air pollution abatement equipment is described. The approximate characteristics and costs of major collector systems are tabulated.##

02232

R.L. Stenburg, T.P. Hangebrauck, D.J. Von Lhdmden,
A.H. Rose, Jr.

EFFECTS OF HIGH VOLATILE FUEL ON INCINERATOR EFFLUENTS. J. Air Pollution Control Assoc. 11, 376-83, Aug. 1961 (Presented at the 53rd Annual Meeting, Air Pollution Control Association, Cincinnati, Ohio, May 22-26, 1960.)

A readily vaporizable solid fuel normally considered as being more difficult to burn than ordinary cellulose was treated in a multiple chamber incinerator having an 8.5 sq. ft. grate area in a 19.5 cu. ft. primary combustion chamber, a downpass mixing chamber and a 16,5 cu ft. final combustion chamber. One part shredded asphalt saturated felt roofing composed of 60% petroleum base asphalt, 37 1/2% felt, and 2 1/2% ash with one part 4" squares of newpaper was the fuel mixture. The effects of combinations of excess air (100 and 200%), fuel feed rate (100 and 150 lb/hr), fuel per charge, underfire air (15 and 60%), and secondary air on the emission of particulates, oxides of nitrogen, hydrocarbons, carbon monoxide, formaldehyde, and smoke were evaluated. Optimum conditions imply a temperature range of 1800 to 2000 F in the secondary chamber, 15 to 20% underfire air, and small batch on continuous charging.##

02244

A.H. Rose, Jr., R.C. Stahman, M.V. Korth

DYNAMIC IRRADIATION CHAMBER TESTS OF AUTOMOTIVE EXHAUST, PART I.
J. Air Pollution Control Assoc. 12, 468-73, Oct. 1963.
(Presented at the 55th Annual Meeting, Air Pollution
Control Association, Chicago, Ill., May 20-24, 1962.)

The data from this series of tests run under dynamic irradiation conditions show differences attributable to: (1) the concentration of exhaust gas at which the irradiation was made, and (2) the composition of the fuel used to produce the exhaust gas. Evaluations of the variations in chemical reaction and biological effects show: (1) The rate of NO2 formation increased proportionately with both exhaust concentration and olefin content of the fuel. (2) The percentage of NO2 reacting with unreacted fresh exhaust components and with secondary reaction products varied inversely with the increase of the exhaust concentration level. (3) No consistent change in oxidant concentration level (primarily ozone) resulted from an inarease in the hydrocarbon concentration level at which the irradiation was made. (4) Formaldehyde formation increased in direct proportion to the increase in hydrocarbon concentration at irradiation. (5) Plant effects indicate a shift in the type of phytotoxicant developed and a decrease in damage level with increase in the hydrocarbon concentration level at which the irradiation was made. (6) Bacterial effect showed a significant increase in degree of kill with increase in hydrocarbon concentration level at which the irradiation was made. (Author summary)##

02312

AIR RESOURCES OF UTAH. Utah Legislative Council, Salt
Lake City, Air Pollution Advisory Committee. June 1962.
32 pp.

A survey was made of the available information concerning air pollution problems in Utah. No evidence was found to indicate that Utah has a major air pollution problem at this time; however, a few perisistent problems exist in restricted areas. Over the years three air pollution situations in Utah have produced injury to plant and animal life or have constituted a public nuisance. These are: (a) sulfur dioxide in Salt Lake Valley (non-ferrous smelters, burning of coal, gasoline combustion, and petroleum refining are the principal sources); (b) smoke and smog along the Wasatch Front and in other localized areas (burning of coal, open burning on municipal dump grounds and in junk yards, and waste disposal around private homes constitute the major sources); and (c) fluorides (processing of Utah ores by steel mills in Utah County, brick and ceramic plants, phosphate fertilizer plants, and general combustion processes are the principal sources. Industry has made substantial progress in alleviating sulfur dioxide, fluorides, smoke, and hydrocarbons by installing expensive control equipment and by supplementing this equipment with extensive research, survey, and monitoring programs. Legislation authorizing the state, or cities and towns, to deal with public nuisances if ound in the Utah Code. There is no definition of air pollution, however, and its treatment as a nuisance is questionalbe. Enabling legislation should define the problem, permit study of its effects, and permit actions to control injurious practices. (Author summary modified)##

02335

H. K. Newhall.

THEORETICAL AND EXPERIMENTAL INVESTIGATION OF CHEMICAL KINETICS DURING RAPID EXPANSIONS OF HIGH TEMPERATURE COMBUSTION PRODUCTS (DOCTOR'S THESIS). (For the degree of Doctor of Philosophy in Engineering, California Univ., Berkeley, Graduate Div.) Sept. 1966. 198 pp.

Theoretical analysis predicts that during expansion of combustion products occurring in internal combustion engines, the rate of atom and free radical recombination is sufficient for equilibration of these species. It is further predicted that as a result of kinetic limitations, nitric oxide persists in hyper-equilibrium concentrations. Theoretical analysis of the kinetics of the expansion process was performed through use of a digital computer. Overall reactions considered were the decomposition of nitric oxide and the recombination of atomic oxygen, atomic hydrogen and the hydroxyl free radical. Rate expressions for the overall reactions were formulated through consideration of all significant elementary reactions. Reaction rate data for the elementary reactions were obtained from a large number of published sources. Nitric oxide is of considerable importance in the problem of automotive air pollution and an experimental study of nitric oxide decomposition occurring during engine cycle expansion was undertaken. A single cylinder research engine was equipped with an infrared transmitting window. The emergent infrared radiation was studied by means of spectroscopic equipment making possible the determination of nitric oxide concentrations throughout expansion. The results indicate that nitric oxide concentration remains fixed throughout the entire expansion process. (Author summary modified)##

02355

S.T. Cuffe C.M. Dean

ATMOSPHERIC EMISSIONS FROM SULFURIC ACID MANUFACTURING PROCESS;

A COMPREHENSIVE ABSTRACT. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Ontario, Canada, June 1965.)

This paper includes basic descriptions of both the chamber and contact processes. Variations in process conditions that may appreciably change the magnitude of emissions, e.g., the manufacture of oleum or the use of different sulfur bearing feed materials, are noted. Concentrations of both nitrogen oxides and sulfur dioxide emissions from chamber plants were found to range from about 0.1 to 0.2 volume percent. The concentration of combined acid mist and spray from chamber plants varied from about5 to 30 milligrams per cubic foot. For contact plants, the range of sulfur dioxide concentrations in the absorber exit stack ranged from 0.13-0.54 volume percent; while acid mist concentrations varied from 1.1 to 4.8 milligrams per cubic foot. The test data show that it is possible to recover 99 percent of all of the acid mist and spray emissions by adding commercially available mist elimination. (Author abstract)**

02362

J.H. Ludwig

STATUS OF VEHICLE EMISSIONS IN AIR POLLUTION. Preprint. (Presented at the Eighth Annual Environmental Health Inst., Colorado Association of Sanitarians, Denver, Apr. 26, 1963.)

Review of the various classes of motor vehicles in use today and associated power plants indicates that as a group the gasoline-powered passenger car accounts for the major share of auto exhaust emissions associated with production of photochemical smog. Of the various sources of emissions from all types of vehicles, tailpipe emissions from gasoline-powered vehicles are the most significant, followed by crankcase

02610

C. V. Kanter, and R. G. Lunche

EMISSIONS AND POLLUTANT LEVELS (TRENDS IN LOS ANGELES). Arch. Environ. Health 8, (1) 5-14, Jan. 1964. (Presented at the Sixth Annual Air Pollution Medical Research Conference, San Francisco, Calif., Jan. 28-29, 1963.)

For accurate assessment of the problems, needs, and progress of an air pollution control program, accurate information must be obtained on emissions of contaminants from sources, and on contaminant levels. This is a very large task, requireing the acquisition of a great mass of data on a continuing basis. In a large community suffering the blight of smog, the acquisition of data is imperative in order to take effective action to stop the advancing menace and to begin a trend back toward clean air. In Los Angeles total air pollution surveys and air monitoring activities have provided the means for understanding the basic causes of the smog problem, and for guiding actions which have slowed the advance of smog and which will turn it back. Inspection of trends of emissions and contaminant levels in Los

Angeles County affirms that a vigorous control program on stationary sources can slow and even reverse trends. It is clear though, that permanence of these effects cannot be achieved until the increasing emissions from motor vehicles are controlled. Of the major contaminants discussed, only sulfur dioxide, which is not significantly affected by motor vehicles emissions, has regressed. ##

02635

J. H. Boddy and D. Turner

A DEFINITION OF THE PROBLEM AND SIGNIFICANCE OF AIR POLLUTION FROM PETROL-ENGINED VEHICLES (PART I OF ATMOSPHERIC POLLUTION: A SURVEY OF SOME ASPECTS OF THE EMISSIONS FROM PETROL-ENGINED VEHICLES AND THEIR TREATMENT). British Technical Council of the Motor and Petroleum Industries, England. Sept. 1965. pp. 1-34.

World-wide legislation is reviewed; the existing and probable restriction on vehicle use and design is presented. The motor vehicle pollutants are detailed. The public health significance is examined. Automotive emissions are compared to those from other sources. Existing legislation in the western and non-Communist world, other than the Californian legislation, imposes negligible restrictions on the gasoline engine at present, but shows indications of imminent action. Legislation in many countries is framed in such a way that regulations against emission from gasoline vehicles could be enforced without major revision of legislation. This is most apparent in recent revisions of legislation, e.g. Ireland, France, and Belgium. When and if the present legislation in the U.K. is successful in controlling pollution from industrial and domestic sources, more attention must inevitably focus on the motor vehicle. The gasoline-engined vehicle makes a major contribution to the following pollutants: carbon monoxide, unburnt hydrocarbons, and oxides of nitrogen. Of these pollutants referred to, carbon monoxide is certainly the most undesirable. Oxides of nitrogen may be more damaging in respect to chronic exposure but evidence is limited. Unburnt hydrocarbons in vapour form appear significant only in relation to photochemical smogs. Heavy hydrocarbons in association with non-particulate matter, like oxides of nitrogen, have possible significance in relation to effects of chronic exposure. The use of lead in gasolines appears to have minor significance as a health hazard in respect to its pollution of the atmosphere. Major attention should be immediately devoted to the reduction of carbon monoxide emission from automotive vehicles. In the interests of clarifying the situation and, as a safeguard against possible legislation of an unnecessarily restrictive nature, the motor and petroleum industries should support research into the significance of such emissions as oxides of nitrogen and heavy hydrocarbons and methods of reducing these.##

02636

J. A. Walker

INFLUENCE OF GASOLINE COMPOSITION ON THE CONSTITUTION OF ENGINE EXHAUST (PART II OF ATMOSPHERIC POLLUTION: A SURVEY OF SOME ASPECTS OF THE EMISSIONS FROM PETROL-ENGINED VEHICLES AND THEIR

TREATMENT). British Technical Council of the Motor and Petroleum Industries, England. Sept. 1965. 35-64 pp.

The major component, adverse to health, in gasoline engine exhausts is carbon monoxide. Fuel composition has no influence on the production of this toxic compound and it is recommended therefore that work is carried out to develop other practicable methods of minimixing CO in engines of European design. Traces of unburned hydrocarbons are also present in exhaust gases and in California they contribute to smog formation by participating in photochemical reactions promoted by sunlight. This reaction rarely occurs in Europe, and thus hydrocarbons are of importance only because they may make a small contribution to the presence of carcinogenic compounds in the air. The AMA has stated that in some 1966 model cars, an engine afterburner system will be fitted as original equipment which will convert CO and hydrocarbons to the harmless compounds CO2 and water. Any method adopted in Europe for removing CO from exhaust gases is likely to be of a similar type and inevitably the major part of the hydrocarbons present in the exhaust will also be converted into innocuous materials. It is recommended that work is carried out to assess the importance of the presence of oxides of nitrogen in the air, and if necessary to develop means of preventing their emission from gasoline engine exhausts. Particulate matter is emitted from engine exhausts consisting of sulphur compounds, carbon, compounds of lead and other materials. At the present it is not considered that these represent any appreciable health hazards, but it is recommended that close touch is maintained with workers in the U.S.A. and in the U.K. who are measuring the concentration and nature of particulate matter in the air, particularly under high traffic density conditions. Evaporation of gasoline vapours from the car fuel tanks and carburetors will probably be controlled in the U.S.A. The contribution to atmospheric pollution from these sources must be extremely small, but it is recommended that some work is carried out in European engines to investigate the factors involved. (Author summary)##

03061

THE ATLANTIC RICHFIELD NITRIC OXIDE REDUCTION SYSTEM.
Preprint. Has now been published by the ARCO Chemical Co.
Sept. 1966, 31 pp. ARCO Chemical Co., Anaheim, Calif. 1966

During the last six years an extensive study of the use of exhaust gas recirculation has been made and a simplified control system (Nitric Oxide Reduction System) was developed which eliminated many problems previously encountered and achieved the required reduction of nitrogen oxides without impairing vehicle performance. In this system exhaust gas is taken from the heat riser at a point directly beneath the carburetor, flow controlled by means of a butterfly control valve, then distributed to the individual passages of the intake manifold by means of distribution tubes. The control valve is actuated by the throttle linkage and designed to permit recycle flow at part throttle and cruising operations. For closed throttle operation such as idle and deceleration, and for wide-open throttle, when maximum performance is desired, the cycle rate control valve is in a closed position. The entire unit, with the exception of the rate control valve shaft and throttle linkage, is enclosed entirely within the intake manifold. It has been demonstrated that the use of recycle reduces peak temperatures and pressures. It is probable that the reduction of nitrogen oxides results from the reduction in peak temperature. Conceivably, the dilution of the air-fuel mixture by the presence of inert exhaust slows the rate of combustion causing the lower peak temperatures. There are other possible benefits from the use of the system such as a reduction of hydrocarbons and cylinder bore wear, and less erosion of spark plug electrodes.##

03072

T. R. Brogan and P. Dragoumis

THE DEVELOPMENT OF MHD POWER GENERATORS. Preprint. (Presented at the National Coal Association Technical-Sales Conference and Bituminous Coal Research, Inc., Annual Meeting, Pittsburgh, Pa., Sept. 14-15, 1966.)

The promise of the MHD concept lies in improving the efficiency of converting the energy of our primary fuels to electricity. Although MHD may find ultimate application with nuclear fuel, only combustion-driven generators are deemed practical for early development. Both the projected economic performance of nuclear power and the growing concern over environmental pollution greatly enhance the need for a highly efficient more economical coal-fired generating system. By burning less coal per unit of energy output, less sulfur will be discharged to the atmosphere. Then, too, the economic necessity for efficient recovery of the seed material and the simple and inexpensive method developed for effecting this recovery, will insure that the MHD plant effluent is thoroughly cleansed of particulate matter. With regard to the formation and emission of various oxides of nitrogen the performance of MHD cannot be easily predicted at this time. Clearly, the equilibrium concentration of nitrogen oxides at the combustion of that which we wish to release directly to the atmosphere. It is not at all certain that equilibrium will, in fact, be attained in the combustion chamber. Beyond this, there is also a question as to the extent to which any concentration of nitrogen oxides will be "fixed" in the subsequent expansion through the MHD generator and stream generator. It is therefore not certain at present, what means should be utilized to best control the amount of fixed nitrogen which ultimately reaches the stack. Measurements indicate that the concentration of nitrogen oxides the effluent from MHD power plants burning coal with atmospheric air preheated to 1000 F will be of the same order of magnitude as from conventional power plants today. For use of significantly higher flame temperatures attained with higher preheat, careful attention must be given to MHD generator design and operation to control the nitrogen oxide concentration in the flue gas. The relatively small size of the MHD combustion chamber which results from the combustion process can make it possible to exercise precise control over the gas composition. The development of MHD has reached the point where the construction and operation of an experimental MHD power plant, duplicating, at a level of about 30 MW, all of the features of a commercial MHD power plant, is technically feasible and justified by the ultimate promise of the concept.##

03110

J. L. Blumenthal M. J. Santy

AN EXPERIMENTAL INVESTIGATION OF THE BEHAVIOR OF BERYLLIUM METAL IN SIMULATED LAUNCH PAD ABORT ENVIRONMENTS. Sandia Corp., Albuquerque, N. Mex. July 1965. 219 pp.

The experimental investigations of the reaction kinetics and flame environment reactions of beryllium are reported. Experiments were conducted using seven combustion gas species (O2, N2, H2O, H2, NO, CO, and CO2) to determine the rate of release of airborne beryllium or its compounds in the event of a catastrophic launch pad accident. Beryllium heated to 2400 F in an environment of water vapor in combination with oxygen will ignite and burn with a release of large amounts of beryllium oxide smoke. (Author abstract)##

03113

R.W. Gerstle, S.T. Cuffe, A.A. Orning, C.H. Schwartz

AIR POLLUTANT EMISSIONS FROM COAL-FIRED POWER PLANTS, REPORT NO. 2. J. Air Pollution Control Assoc. 15, (2) 59-64, Feb. 19659

The Public Health Service and the Bureau of Mines are conducting a joint study to evaluate a number of flue-gas-stream components from coal-burning power plants. Emissions of fly ash, sulfur oxides, nitrogen oxides, polynuclear hydrocarbons, total gaseous hydrocarbons, formaldehydes, certain metals, and carbon dioxide are determined. A previous paper covered air pollutant emissions from vertical-fired and front-wall-fired power plant boilers. This paper includes a comparative evaluation of emissions from a tangential-fired and a turbo-fired power plant boiler. (Author abstract)##

03122

M. Brunner, P. Lemaigre

METHODS OF REDUCING POLLUTION CAUSED BY INTERNAL COMBUSTION ENGINES. (Motor Vehicles). European Conf. on Air Pollution Strasburg, 1964. p. 191-258.

As a result of the growth of industry and the subsequent development of motor vehicles, European countries are faced with an air pollution problem the nature and size of which depend not only on the degree of industrialisation and the number of motor vehicles in sue but also on the density of population and industry, traffic conditions and geographical and climatic conditions. The problem of pollution from motor vehicles in Ireland or Norway is different from that in Germany. The problem in France as a whole is not the same as the problem in Paris. The problem in Paris is, in turn, different from the smog problem in London, while the latter problem is different again from the smog problem in Ios Angeles. In Belgium, Ireland, Norway, the Netherlands, Sweden, Switzerland and even Italy, the interest of the public, the police and legislature is concentrated mainly on the visible smoke from diesel vehicles, while petrol-driven vehicles are not yet regarded as a very serious source of pollution. In Switzerland, the inspection authorities have been primarily concerned from the outset (apart from gas emissions by factories) with the quantities of CO and lead compounds to be found in the air along traffic routes. This work began in the years immediately following the appearance of ethyl motor spirit on the market (1947). In the United Kingdom, attention also seems to be directed mainly towards other sources of pollution. In the Federal Republic of Germany and France mortality and morbidity statistics, reports on pollution t*ends in particular areas, the effects of pollution on people, plants and masonry have made doctors and learned societies alive to the changes, led to Press campaigns and impressed public opinion and government departments. The issue is not only the nuisance caused by smoke, but, above all, the poisonous nature of the exhaust gases of petrol engines. Considered are: (1) - the organisation of anti-pollution action in each state; (2) - studies and research; organisation, co-ordination and results; (3) - methods and equipment which can be used to reduce pollution; and (4) - anti-pollution legislation in Europe.##

03154

N. E. Flynn and W. R. Crouse

REPORT ON NITROGEN OXIDES IN THE BAY AREA AIR POLLUTION CONTROL DISTRICT. Preprint. 1964.

Total oxides of nitrogen (NOx) emissions in the Bay Area Air Pollution Control District for 1963 are estimated at 515 tons/day. A summation of emissions of oxides of nitrogen by general source categories is presented. Transportation at 323 tons/day is the major source category of nitrogen oxides emissions and accounts for 63% of all oxides of nitrogen emissions for the Bay Area. Combustion operations at 150 tons/day are the second largest source category and contribute 29% of the nitrogen oxides emissions. Emissions from small, medium, and large stationary sources with incinerations, agriculture, and transpotation sources grouped separately, are presented. (Author summary modified)##

03198

AUTOMOTIVE AIR POLLUTION (FIFTH REPORT OF THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE TO THE U.S. CONGRESS IN COMPLIANCE WITH PUBLIC LAW 88-206 AS AMENDED BY PUBLIC LAW 89-272). 90th Congress (1st Session) (Document No. 8) Dec. 1966. 14 pp.
GPO 74-5880

The procedure is described whereby the manufacturer may apply for a certificate of conformity and it describes the activities of the certification laboratory established by the Department to verify the manufacturer's test data. The status of legislation at the

State level to provide for continued compliance following Federal certification is also covered. The effectiveness of the Federal control program, as it may be anticipated from early experiences under California's similar program, is discussed in a section on surveillance testing. The Federal standards, which were established March 31, 1966, are subject to revision as new dimensions of the problem are defined and as limitations become apparent in the implementation of existing standards. Current standards of emissions control apply to two contaminants, hydrocarbons and carbon monoxide, and to two possible emission sources, crankcase and exhaust systems. It is probable that nitrogen oxide, lead, sulfur dioxide, odor, and particulate components of motor vehicle exhaust will become the subject of future standards; the fuel system and evaporation losses associated with it is the subject of study for early inclusion among systems requiring control. Research studies upon which revised standards and procedures will be based are reviewed. The policy which will prevail in the establishment of new emission standards on a national level is one which will recognize the needs of the most susceptible members of the population at risk and the quality of the air where the risk is highest. Sections of this report deal with the air quality as it refelcts the extent of the automotive air pollution problem in many cities across the United States and its potential influence on the health and well-being of their citizens. (Author summary modified)##

03202

V. Del Vecchio.

THE PROBLEMS OF BASIC URBAN AIR POLLUTION. Il problema dell'inquinamento di fondo urbano dell'aria atmosferica. Fumi Polveri (Milan) 6, (6) 177-8, June 1966.

Basic urban air pollution refers to the discharge into the air of exhaust gases from motor vehicles and from heating units, which are prevalently inefficient. Both sources discharge respirable dusts and gases, the latter including some aliphatic and aromatic hydrocarbons which have proven carcinogenic in experimental animals. The problem arising from the incomplete combustion of motor fuels is aggravated by the presence, in Italian cities, of narrow streets and relatively high buildings which become repositories of emitted fumes and dust from slow-moving vehicles. As much as 12 to 13% CO may be present in gasoline-driven motor car exhaust. While gross measurement of pollutants present in the urban air is of high indicative value, public health aspects of the problem demand that granulometric studies of the dust particles also be conducted, since size is a factor in respirability. In addition, photochemical studies involving the interaction between the pollutants in the air and the sun's rays indicate that solar radiation transforms the originally present contaminants into biologically more receptive compounds, quite different from their precursors. Thus peroxacetylnitrate(PAN) is produced from NOx, and the new substance is a powerful irritant of the mucus membranes. The dramatic episodes of mass illness resulting from smog in various places in recent years were caused by the phenomenon of thermal inversion which prevented the dispersion of the irritants present in the air.##

03233

W. Thurauf and W. Ehnert

((THE FORMATION OF NITRIC OXIDE DURING COKING.)) Uber die Bildung von Stickstoffmonoxid bei der Verkokung und seine Bestimmung ir Koksofengas. Brennstoff-Chem. (Essen) 9(48):270-273, Sept. Translated from German as JPRS R-8582-D.

Experiments were undertaken in order to settle the question of where and when nitric oxide is formed during the coking process, and the manner in which the nitric oxide content of coke oven gas changes during the process of coking. The experiments were conducted on a small scale, employing specially designed apparatus with the thermal energy being provided by an electric heater, in order to eliminate the possibility that coking fuels are responsible for the formation of nitric oxide. It was found that nitric oxide begins to form during the first state at which gas is driven off; and that the extent to which it continues as the temperature is raised depends on the type of coal, its granular structure, and the temperature rise. Formation appears to be complete by the time that the coking coal reaches a temperature of 400 C. In the case of ground coals, the finer the grains the lower the formation of nitric oxide, and vice versa; the reverse being true for coal dust obtained by sifting coal that had been stored in the open air. The NO contents of subsequently heated alcohol extracts from coals are approximately the same as those of the same coals directly heated in a helium atmosphere, and are from four to twelve times as great as the volumes contained in the distillation gases obtained during the coking process. This indicated that approximately 90% of the NO which is formed during coking is subsequently decomposed by reactions with the other distillation products. NO is not formed, as formerly believed, through oxidation during coking, but rather from the decomposition of substances which are formed when coal is stored in the open air.##

03255

R. L. Cummins and V. J. Konopinski

MOTOR VEHICLE EXHAUST CONCENTRATIONS IN A ROAD TUNNEL. Preprint. (Presented at the Conference of the American Industrial Hygiene Association, Philadelphia, Pa., Apr. 29, 1964.)

The contribution of motor vehicle exhaust to ambient air pollution was studied by using a vehicular-road tunnel as a sampling site. An intensive aerometric study was conducted April 20 through 28, 1963, at the Sumner Tunnel in Boston, Massachusetts. The tunnel is now operated as a one-way tube. Air quality was determined on the fresh air supplied to the tunnel (inlet air), on the air exhaust from the tunnel (exhaust air), and at three sites within the tunnel. Particulate pollutants were analyzed for total suspended particulates, benzene-soluble organics, sulfates, nitrates, metals, and polycyclic hydrocarbons. Concentration of SO2, oxides N, NO2, aliphatic aldehydes, and CO were also determined. The average concentration of total suspended particulates in the inlet air was 86 micrograms/cu m while that of the exhaust air was 424 micrograms/cu m. The concentrations of total particulates, benzene-soluble organics, sulfates, and nitrates for the inlet and exhaust air were less than reported in a previous study. The ranges of concentrations of oxides N, NO2, and aliphatic aldehydes in the tunnel were, respectively, 11.3 to 43.0, 3.5 to 8.8, and 3.1 to 12.6 parts per hundred million (hereafter referred to as pphm). SO2 concentrations ranged from 0.1 to 0.5 pphm, and were less than ambient concentrations. The mean daily concentration of CO was 2.3 ppm in the inlet air and 50.8 ppm in the exhaust air. Mean concentrations in the tunnel ranged from 20.5 to 54.2 ppm and increased with increasing distance into the tunnel. Other pollutants exhibited a similar gradient. The particulate pollutant concentrations measured during April 1963 study are less than those measured in 1961. This decrease may be attributable to operation of the tunnel with one-way traffic and the concomitant piston effect, and to a 36 percent decrease in the average number of motor vehicles using the tunnel. Values for polycyclic hydrocarbons reported for the 1961 study were in error; corrected values are given in this report. (Author abstract)##

03265

A. F. Bush, R. A. Glater, G. Richards, and J. Dyer

EFFECT OF ENGINE EXHAUST ON THE ATMOSPHERE WHEN AUTOMOBILES ARE EQUIPPED WITH AFTERBURNERS. Proc. Tech. Meeting West Coast Section, Air Pollution Control Assoc., 3rd, Monterey, Calif., 1963.)

"Typical" smog damage of the conventional type if induced in Nicotiana glutinosa when the ratio of pure air to automobile exhaust is in the range of 1000 to 1 in the test facility. A specific cycle of engine operation involving acceleration, cruise, deceleration and idle produced typical damage. The absence of cruise in the cycle caused no damage to occur. With an after burner on the exhaust of internal combustion engines, it becomes apparent that a new type of injury was being induced in Nicotiana glutinosa plants. Fumigations with afterburner exhausts consistently produced atypical plant damage, whereas automobile exhaust fumigations, without afterburner devices, usually produced typical oxidant damage. 2t is considered that since the concentration of hydrocarbons is reduced using the afterburner, one of the principal air polluting agents has been eliminated; typical air pollution therefore, does not occur. This does not mean that plant damage is eliminated, only that the usual type of plant damage appears to have replaced it (atypical). Some of the exceptions to the trends described in #1 above can be explained on the basis of lack of sweep of the tunnel so that residual smog-forming materials may have remained behind. The tunnel must therefore be carefully swept with air passed through beds of activated charcoal for at least 15 hours before the fumigation can have validity. Plant damage does not correlate well with measured concentrations of nitric oxide. Atypical damage is produced however in almost every instance of afterburner exhaust fumigation. Since the fumigation period includes the period when the oxides of nitrogen are high (ppm or so) it may be speculated that the new damage is due to oxides of nitrogen in the absence of high hydrocarbon. There is fair correlation between hydrocarbon concentrations and the appearance of typical damage when no afterburner is used. Afterburner exhaust in the chamber showed no appreciable human eye irritation resulting from the new atmosphere while automobile exhaust without afterburner produced eye irritation of the type described by Buchberg. (Author conclusions)##

03355

R. Sutton and E. S. Starkman

OXIDES OF NITROGEN IN ENGINE EXHAUST WITH AMMONIA FUEL.
California Univ., Berkeley, Dept. of Mechanical
Engineering. (Technical Rept. No. 7 and Rept. No.
TS-66-4.) June 1966. 28 pp.
CFSTI, DDC 640444

At maximum output, more oxides of nitrogen are produced by combustion of ammonia than with hydrocarbon fuels. This is partly a result of peak power occurring at low mixtures with ammonia. Disproportionate quantities of nitrogen oxides which are encountered with ammonia at lean mixture ratios indicate a probable result of the direct production of NO in the ammonia pyrolysis scheme.##

03420

A. H. Rose, Jr., H. H. Black, R.C. Wanta

AIR AND WATER POLLUTION STUDIES RELATED TO PROPOSED PETROLEUM
REFINERY FOR SAND ISLAND - OAHU, TERRITORY OF HAWAII (¬REPORT
TO BOARD OF HEALTH, TERRITORY OF HAWAII). Public Health
Service, Cincinnati, Ohio, Div. of Air Pollution. Dec.
1955. 60 pp.
HEW

The objective of the atmospheric pollution phase of this study was na evaluation of the possible effect on the atmosphere of the City of Honolulu which may result from the operation of a 24,000-barrel-per-day modern fluid catalytic cracking refinery. Two factors were investigated, first the extent and causes of the current atmospheric pollution level, and second the potential impact on the pollution level which may result from the refinery operation. Process design for the proposed refinery was tentative in that only process flow and major process units were fixed; interflow of components between process units and their elements had not been finalized. Data covering the operation of and atmospheric contaminant discharge from existing industrial operations were relatively meager. Data on the concentrations of specific contaminants in the Honolulu atmosphere were not available. Only published climatological data were available . The quantity of specific atmospheric contaminants from both existing sources and the proposed refinery are presented as determined from the best available data.##

03584

G. P. Cann, W. M. Noble, and G. P. Larson

DETECTION OF SMOG FORMING HYDROCARBONS IN AUTOMOBILE EXHAUST GASES USING PLANTS AS INDICATORS. Air Repair 4, (2) 83-6, Aug. 1954.

Following the identification of hydrocarbons in the 4, 5 and 6 carbon atom range in automobile exhaust gases, it became necessary to determine whether these hydrocarbons, mixed with other exhaust gases, could produce typical smog effects. A study was carried out in which the atmospheric reaction of hydrocarbons was duplicated in the Air Pollution Control District's plexiglas house. Certain plants, which had already been proved susceptible to smog damage, were used as indicators. Gasoline vapor was used as the standard against which the plant damaging effects of automobile exhaust gases were compared. Results show that automobile exhaust hydrocarbons are capable of producing effects equivalent to those resulting from smog. (Author abstract)##

03871

L. B. Hitchcock

AIR POLLUTION AND THE OIL INDUSTRY. Proc. Am. Petrol. Inst., Sect. IV. 35, 150-4, 1955. (Presented at the spring meeting, Pacific Coast District, American Petroleum Inst. Division of Production, Los Angeles, Calif., Apr. 28, 1955.)

While most of Los Angeles' air pollution is traceable to petroleum products, by far the largest share arises from the use to which these products are put. Motor-vehicle exhaust accounts for the largest single source of pollution. Fuel oil and gas also contribute. Incineration of refuse and metallurgical and miscellaneous industrial emissions account for most of the balance. The public, through its motor vehicles and rubbish burning, contributes more than half the total pollution. The oil industry, indispensable to the community's growth, has done more than all the rest of the area in developing and adopting corrective measures, and has reduced its emissions very substantially. Petroleum production in Los Angeles County contributes a very minor part to air pollution. Hydrocarbons and nitrogen oxides in combination produce smog effects, although neither alone, at concentrations found, is known to be deleterious. Cleaner air costs money, but less than smog. Intevsive application of science and engineering to the overall problem is the only road to success. (Author abstract)##

03883

E. A. Schuck and G. J. Doyle

A STUDY OF IRRADIATED AUTO EXHAUST. Stanford Research Inst., South Pasadena, Calif., Southern California Labs. (Rept. 9 and Technical Rept. 11.) Feb. 1958. 65 pp.

Aerosol was formed by irradiation of exhaust-air mixtures. The aerosol thus formed was in the submicron size region but was of sufficient concentration to reduce visibility appreciably--in some instances from around 40 miles down to 2 or 3 miles. The severity of eye irritation is dependent on the concentrations of hydrocarbons and nitrogen oxides. More particularly, a relationship has been established between the concentration ratio of hydrocarbons and oxides of nitrogen and the degrees of eye irritation, the degree of irritation being dependent on the concentration ratio. This ratio also influences the rate of formation of the aerosol, oxidant, and indicated nitrogen dioxide. Varying the relative humidity in the exhaust-air mixtures between 40% and 80% and the temperature between 26 C and 40 C had no detectable effect on any of the measured symptoms. Eye irritation increased as the light intensity was increased from zero to 3/4 the intensity of noonday sunlight, but did not appear to increase with a further increase in intensity up to about twice that of noonday sunlight. Eye irritation intensity was found to be a function of residence time under irradiation. The results indicate that the length of time that pollutants reside under irradiation has an effect on the severity of smog symptoms, i.e., leads to an increase and then a decrease in eye irritation with time. The smog potential from an auto exhaust mixture appears to be intimately associated with hydrocarbon concentration, oxides of nitrogen concentration, the concentration ratio of hydrocarbons to oxides of nitrogen, light intensity, and residence time under irradiation. The half life of the eye irritant produced by irradiating dilute auto exhaust was determined to be in the order of 24 hr, indicating the presence of a rather stable irritant. The half life of the aerosol was found to be 12 hr, and that of the oxidant or indicated nitrogen dioxide was less than one hour. Thus, from the measure of half life, the aerosol, oxidant, and indicated nitrogen dioxide do not appear to be intimately associated with eye irritation.##

03988

W. Henny R. Herrmann

NEW DIESEL COMBUSTION CHAMBER GIVES SMOOTHER COMBUSTION AND CLEANER EXHAUST. S.A.E. 8Soc. Automotive Engrs.) J. 84, (7) 39-42, JULY 1966.

The Hispano-Suiza combustion chamber is described. It uses a spherically shaped upper section with high turbulence to lower cycle pressures and gives lighter and less toxic exhaust than a direct injection system. The chamber construction; combustion process; and smoke, CO, and NOx emissions are discussed.##

04008

J. T. Gray, Jr., E. Dimitroff, N. T. Meckel, and P. D. Quillian, Jr.

AMMONIA FUEL - ENGINE COMPATIBILITY AND COMBUSTION. S.A.E. (Soc. Automotive Engrs.), Preprint. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966.)

Full-scale engine studies were conducted to determine the feasibility and compatability of ammonia combustion in various systems. Briefly outlined is the spark-ignition investigation undertaken by the Army Laboratory to learn the potential and effect of ammonia as a fuel and to study the influence of engine variables on combustion. A study of compression-ignition performance was made to ascertain the ability of ammonia to be pumped in existing injection systems and various means of achieving ammonia combustion were explored. Compatibility of ammonia and its combustion products with engineering materials and lubricants presents no substantial problem. Satisfactory delivery of ammonia may be accomplished by cooling the inlet to the injection pump. Ammonia-only combustion requires high compression ratios and temperatures (35:1 compression ratio, 300 F air and coolant). Ammonia may be ignited by pilot fuels at compression ratios as low as 12:1, depending upon the cetane number of the pilot. None of the fuel additives investigated significantly lowered the energy level requirement for ammonia ignition. Gases introduced into the intake manifold resulted in ammonia combustion although amounts required were high: (10% hydrogen, 15-20% acetylene). High temperature glow coils were suitable ignition sources but spark plugs and standard glow plugs failed to initiate combustion.##

04028

R. E. Kruse and D. M. Hill

EXHAUST EMISSIONS FROM COMPACT CARS. Preprint. (Presented at the Society of Automotive Engineers Meeting, Dayton, Ohio, Mar. 14, 1967.)

The purpose of this study was to develop basic emission data that will provide background information for the setting of Federal emission standards that weigh as equitably as possible the relative contributions to air pollution of different passenger cars varying both in gross vehicle weight and in engine displacement. This was accomplished by determining for a variety of imported and domestic compact vehicles the concentrations and mass levels of emissions of hydrocarbons, carbon monoxide, and oxides of nitrogen during operation on the road and on a chassis dynamometer (7-mode cycle, hot start). The compact vehicle was defined as any car weighing less than 3,000 pounds with an engine displacement of less than 200 cu. in.##

04181

R. Inove, T. Iritani, H. Yanagisawa, G. Saito, and
H. Maeda

ANALYTICAL STUDIES ON THE ATMOSPHERIC CONDITIONS INDUCED BY CO2-O2 ARC WELDING. Japan. J. Ind. Health (Tokyo) 1, (3) 218-23, June 1959. Jap.

A rise in temperature and a decrease in humidity were more noticeable with a CO2-O2 arc welding process using a new gas-shielded metal arc-welding method than with manual welding with covered electrodes. Experiments were conducted in a small cabin to analyze the atmospheric conditions created by this new method. The increase in carbon dioxide was not great although it was greater than in manual welding; this increase was caused by the natural ventilation associated with the rise in temperature. The level of carbon monoxide was raised, but only a little more than in other welding processes. The production of ultraviolet radiation was less than in other welding. The production of ozone and nitrogen dioxide was so slight that they would not cause poisoning. The quantity of dust produced was rather large, but was less than with welding with covered electrodes. In using CO2-O2 arc-welding processes in a small room, one must pay attention to good ventilation of the room, but since this welding process is usually used in a large room with good natural ventilation, there are very few hygienic problems with regard to the process. (Author summary modified)##

04200

F. E. Gartrell

CONTROL OF AIR POLLUTION FROM LARGE THERMAL POWER STATIONS. Rev. Soc. Roy. Belge Ingrs. Ind. (Brussels) (11) 471-82, Nov. 1966. (Presented at the Symposium on Air Pollution Control, Essen, Germany, Mar. 9, 1966 and at the Belgian Royal Society of Engineers and Industrialists Meeting, Brussels, Belgium, Mar. 16, 1966.)

Measures for the removal of particulates from stack gases and reductions in SO2 emissions as well as the dispersion of emissions by high stacks and control by operational procedure are discussed. The results of air pollution monitoring near large power stations of the TVA are reviewed. Gas cleaning devices have been perfected so that 99.5% of the original ash content of the coal may be removed, although costs increase rapidly above 95%. In the future, removal of 99.5% of ash may be necessary in some plants based on combined mechanical and electrostatic collectors. There is a trend toward using electrostatic precipitators alone because of the high draft losses with mechanical collectors. While there are a number of promising developments in the removal of SO2 from fossil fuels, the principal reliance for the next few years will have to be placed on dispersion from high stacks with possible supplementary operational controls. The height of TVA stacks varies from 150 to 800 ft, and tables are given of relationship between the maximum ground level SO2 concentration, stack height, and wind speed. Data are also given of the frequency of occurrence of various ground levels of SO2 in the area around the plants.##

04609

M. Kennebeck, Jr., R. Wetherington, D. A. Nole, H. Roby, and M. Y. Longley

TOXIC HAZARDS EVALUATION OF TITAN II TEST FIRINGS: METHODS AND RESULTS OF LABORATORY AND FIELD INVESTIGATIONS. Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio, Aerospace Medical Div. and Aerojet-General Corp., Azusa, Calif. (Technical Documentary Rept. AMRL-TDR-63-52.) (Aerojet-General Rept. 2552.) June 1963. 79 pp.

Toxicologically significant environmental contaminants near Titan II test-stand facilities were studied, with specially developed field and laboratory techniques, primarily to determine the degree of hazard associated with exhaust constituents. For exhaust products that were identified and quantitatively evaluated, it was found that normal test firings create no significant personnel hazard in test areas and that, with proper treatment procedures, no significant water-pollution problems are created. A method for determining Titan II test-firing contributions to a community-air-pollution situation was also developed. This study emphasizes the need for investigation of more refined atmosphere analysis techniques and instruments to determine trace contaminants resulting from static and dynamic missile firings. Detailed analytical methods for field samples containing unsymmetrical dimethylhydrazine, hydrazine, and nitrogen dioxide are presented. (Author abstract)##

04792

R. E. George and P. M. Burlin

AIR POLLUTION FROM COMMERCIAL JET AIRCRAFT IN LOS ANGELES COUNTY. Los Angeles County Air Pollution Control District, Calif. (Apr. 1960). 67 pp.

An investigation of commercial jet aircraft operations at Los Angeles International Airport to determine the daily emission of atmospheric air contaminants was made. Smoke emissions and other air contaminants are byproducts from the combustion of fuel used in the turbojet engines. The jet exhaust was tested for particulate matter, aldehydes, oxides of nitrogen, hydrocarbons, carbon monoxide, carbon dioxide and oxygen. Evaluation of the data suggest that the total contaminant emissions from jet aircraft operations are insufficient to produce any generalized deterioration of air quality. Visible smoke emission from commercial jet aircraft do occur during take off and landing but on take-off the emission of smoke in excess of legally allowable opacity limits is well within the allowable three minute time limit and on landing the smoke emissions do not exceed the opacity limits.##

04808

J. H. Ludwig

THE VEHICLE POLLUTION PROBLEM. Preprint. (Presented at the American Public Power Association Conference, Denver, Colo., May 8-11, 1967.

The problem of emissions from motor vehicles is reviewed from the standpoints of the contribution of vehicles to community air pollution, present progress in control regulations and application of devices, and the immediate and longer-term outlook for additional controls. (Author abstract)##

04994

P. L. Magill, D. H. Hutchison, J. M. Stormes

HYDROCARBON CONSTITUENTS OF AUTOMOBILE EXHAUST GASES.
Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif.,
1952. pp. 71-83.

The aim was to present the results of mass spectrometer analyses of hydrocarbons exhausted by passenger car exhausts. The ultimate objective was to arrive at an estimate of the amount of hydrocarbons released into the Los Angeles atmosphere by gasoline-burning vehicles. The exhaust gases of automobile passenger cars were analyzed for C1 to C7 ; hydrocarbon content passenger cars were analyzed for b8c1 to C7 + hydrocarbon content with the mass spectrometer. The hydrocarbons found include methane, acetylene, paraffins, and olefins from b8c2 to C7+. The exhaust composition was found to be independent of the type of gasoline burned, using gasolines ranging from premium gasoline of current-day producers to saturated straight-run gasoline typical of prewar production. New cars and old cars showed relatively little difference in exhaust composition during acceleration and steady driving. Under conditions of idling and deceleration, the hydrocarbon content exhausted from prewar cars was approximately twice that of postwar cars. Over the range of driving conditions encountered in city traffic, there is a loss of hydrocarbon out of the exhaust ranging from 5 percent of the weight of fuel entering the carburetor under conditions of steady driving to 19 percent during periods of deceleration. The total quantity of C1 to C7+ hydrocarbons released by automobile exhausts to the atmosphere over Los Angeles County during a twenty-four-hour day is estimated to be about 850 tons.##

04995

E. L. Hall

PRODUCTS OF COMBUSTION OF GASEOUS FUELS. Proc. Natl. Air
Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 84-9.

Data on the combustion products of fuel gases is reviewed. Work on the photochemistry of smog is related to work on vapor phase gum produced in manufactured gas by hydrocarbons and NO2 catalytically oxidized from NO in the presence of butadiene.##

05007

J. H. Ludwig

SEMINAR ON AIR POLLUTION BY MOTOR VEHICLES. Preprint. 1967.
54 pp.

The various facets of the vehicle pollution problem from the standpoint of both effects on community atmospheres nationwide and the source of variables are summarized. The problems that remain today encompass a number of considerations, which may be enumerated as follows: (1) The importance of the diesel problem as it relates to smoke and odor control, the means for securing reduction of smoke and odors, and the development of test procedures for the setting of standards; (2) The importance of relative reactivity of the various organic species, particularly hydrocarbons, and the effects of reactivity on both standards and control methods; (3) The importance of various emission sources (exhaust, crankcase ventilation, fuel tank evaporation and carburetor evaporation losses) in relation to reactivity and need for control and the development of test procedures for these sources from all types of vehicles (passenger cars, trucks and buses); (4) The need for control of nitrogen oxides from vehicular sources, both gasoline engine and diesel engine power sources and concurrently for stationary sources; (5) The importance of instrumentation in measurement of pollution parameters for research, enforcement (certification) procedures, surveillance and inspection; (6) The problems of maintenance of devices on vehicles to insure their continued operation (surveillance and inspection), and/or the upgrading of such devices such that they will be essentially maintenance free; and (8) The importance of in-traffic carbon monoxide levels, particularly their significance relative to driver fatigue.##

05011

A. A. Orning, C. H. Schwartz, and J. F. Smith

MINOR PRODUCTS OF COMBUSTION IN LARGE COAL-FIRED STEAM GENERATORS . American Society Mechanical Engineers New York Paper 64-WA/FU-2.
(Presented at the Winter Annual Meeting, American Society of Mechanical Engineers, New York City, Nov. 29-Dec. 4, 1964 .)

An analysis is given of the minor products of combustion from large coal-fired steam generators in relation to thermodynamic equilibria, unit design and operating conditions. Concentrations of nitrogen oxides and the ratios of sulfur trioxide to total sulfur oxides are near equilibrium values at the furnace outlet. Significant amounts of low molecular weight organic acids and comparatively small amounts of polynuclear aromatic hydrocarbons are found under good combustion conditions. (Author abstract)##

05067

S. T. Cuffe, R. W. Gerstle, A. A. Orning, and C. H. Schwartz

AIR POLLUTANT EMISSIONS FROM COAL-FIRED POWER PLANTS; REPORT NO. 1. J. Air Pollution Control Assoc. 14, (9) 353-62, Sept. 1964 (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

Air pollutant emissions from two types of coal burning power plant furnaces were studied. Particulates entering the fly-ash collector from the low-intensity-mixing, vertically fired boiler of Unit A accounted for 60% of the ash contained in the coal charge. In the high-intensity-mixing, horizontally fired Unit B, 85% of the total ash entering the boiler in the coal was carried to the fly-ash collector. The fly-ash collectors effectively removed 85 to 95% of the particulate matter and showed essentially the same efficiency in removal of common trace metal compounds. Concentrations of sulfur trioxide ahead of the dust collector varied widely. For Unit A, the vertically fired boiler, they averaged about 4% of the SO2 concentration; for Unit B, the horizontally fired boiler, formation of SO3 was lower, averaging less than one percent of the SO2 concentration. The fly-ash collectors effected an appreciable reduction in sulfur trioxide emissions on Unit A but not on Unit B. For both units SO3 emissions were less than one percent of their SO2 emissions. Nitrogen oxide concentrations during normal full-load operation were increased 30 to 40% by passage through an electrical precipitator. Organic acid concentrations were appreciably higher than those of gaseous hydrocarbons, formaldehyde, and carbon monoxide. The very small concentrations of gaseous hydrocarbons, formaldehyde, and carbon monoxide indicated very complete and efficient combustion during both full-load and partial-load operation. Emissions of polynuclear hydrocarbons from large power plant boilers were found to be very small in comparison with those from smaller coal-fired units having less efficient combustion processes.##

05133

Wasser, J., R. P. Hangebrauck, and A. J. Schwartz

EFFECTS OF AIR-FUEL STOICHIOMETRY ON AIR POLLUTANT EMISSIONS FROM AN OIL-FIRED TEST FURNACE. J. Air Pollution Control Assoc., 18(5):332-337, May 1968. 19 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Association, June 11-16, 1967, Paper No. 67-124.)

An experimental, domestic-sized, oil fired test furnace to be used for evaluation of fuel additives and combustion process modifications in reducing air pollutant emissions is described. Operating data and emissions of particulate matter, smoke, carbon monoxide, gaseous hydrocarbons, oxides of nitrogen, and oxides of sulfur are reported over the range of operable air-fuel ratio. Emission levels are interpreted in terms of key operating parameters and potential areas for reduction of emission. (Authors' abstract modified)##

05145

J. L. Sullivan

THE NATURE AND EXTENT OF POLLUTION BY METALLURGICAL INDUSTRIES IN PORT KEMBLA (PART I OF AIR POLLUTION BY METALLURGICAL INDUSTRIES). Australia Dept. of Public Health, Sydney, Division of Occupational Health. 1962. 62 pp.

Air pollution was surveyed in a metallurgical town, Port Kemble, located on the coast of Australia. Iron and copper ores are smelted and the major emissions consist of solid particulates and sulphur dioxide gas. The presence of the latter is most noticeable in the wake of the plume of the stack of the copper smelter during the north-east winds which prevail in summer. In winter the prevailing winds cause industrial pollution to be blown seawards. Tests for sulphur dioxide were made by daily volumetric sampling instruments and a Thomas automatic recorder. The section of the town most severely affected consisted of a swathe of about 200 yards wide and extending to a point where habitation ceased about 0.6 mile from the 200 feet high stack of the copper smelter. Daily readings of the gas were not spectacular and the highest result was 0.62 part per million. During a little more than three years 24 hour readings of 0.2 part per million or more were measured on 39 days. However, a different picture was obtained from the continuous recorder. This showed that high concentrations of sulphur dioxide tended to occur in episodes of a few hours each. Peaks of greater concentration than 5 parts per million were recorded on numerous occasions and the maximum for the sampling period was 13.5 parts per million at a point 0.45 mile from the source. Complaints of respiratory distress were made frequently and most householders had ceased to try to grow vegetables. Dust-fall rates measured as water insoluble solids by a deposit gauge consisting of a six inch diameter conical glass funnel and bottle were high by normal standards. Average annual rates varied between 17.9 and 86.1 tons per square mile per month. In some locations within a half mile from the edge of the steel industries summer dust-fall rates were found to exceed 100 tons per square mile per month. At one point a mile and a half from the steel industries the monthly rate during 1960 varied between 13.6 and 43.4 tons per square mile. Smoke densities were found to be low by comparison with other cities in New South Wales despite frequent evidence of haze. The introduction of oxygen lancing on open-hearth furnaces, without control measures, had little or no effect on smoke density levels. (Author abstract modified)##

05157

Los Angeles County Air Pollution Control District, Calif.
(Sept. 1960). 83 pp.

EMISSIONS OF OXIDES OF NITROGEN FROM STATIONARY SOURCES IN LOS ANGELES COUNTY (REPORT 2: OXIDES OF NITROGEN EMITTED BY SMALL SOURCES).

This program was organized to study source groupings classified according to the discharge of oxides of nitrogen per unit of equipment, as follows: (1) large (those emitting over 100 lbs/hr.); (2) medium (those emitting 5 to 100 lbs/hr.); and (3) small (those emitting less than 5 lbs/hr.). This report discusses the evaluation of data obtained from tests made on small sources. It was calculated that the total weight of NO2 and NO emitted into the atmosphere in Los Angeles County from all small stationary sources averages 59 tons/calendar day during the 6 months' heating season (November through April) and 32 tons/calendar day during the remainder of the year. The weighted average of these amounts is 46 tons/calendar day. Of this weighted average daily discharge of NO2 and NO from all small stationary sources, slightly over half (27 tons) originates from gas-fired commercial and domestic appliances and the remainder (19 tons) from small industrial sources. Most of the NO2 and NO discharged from small industrial sources (approximately 16 tons/calendar day, weighted average) is produced by boilers of less than 500 horsepower rating. Most of the seasonal variations in the total weight of NO2 and NO discharged from small stationary sources are ascribable to the nearly two million residential space heaters, which vent 19 tons/calendar day during the heating season and none during the remainder of the year. A summary of NO2 and NO emissions for all small stationary sources is presented. Investigations of the sampling and analytical techniques employed showed that the chosen procedures and techniques produce reliable analytical results.##

05160

J. L. Mills, K. D. Leudtke, P. F. Woolrich, and L. B. Perry

EMISSIONS OF OXIDES OF NITROGEN FROM STATIONARY SOURCES IN LOS ANGELES COUNTY (REPORT 3: OXIDES OF NITROGEN EMITTED BY MEDIUM AND LARGE SOURCES). Los aAngeles County Air Pollution Control District, Calif. (Apr. 1961). 61 pp.

The total weight of oxides of nitrogen discharged into the atmosphere each day in Los Angeles County from stationary sources was determined. The sources are divided into medium and large sources. Medium sources includes those emitting five to one hundred lbs. NOx per hr. and the large sources includes those emitting over 100 lbs. per hr. The total emissions of NOx from all medium sources amounts to 70 tons per day during the winter and 54 tons per day during the summer. The total emissions of NOx from all large sources amounts to 160 tons per day during the winter and 93 tons per day during the summer.##

05292

J. M. Chandler

EFFECTS OF ENGINE-OPERATING VARIABLES ON THE COMPOSITION OF AUTOMOTIVE EXHAUST GASES . Proc., Am. Petrol. Inst., Sect. III 38, 324-35 (1958). (Presented before a session on air pollution, 23rd Midyear Meeting, American Petroleum Inst. Division of Refining, Los Angeles, Calif., May 15, 1958.)

The factors affecting hydrocarbon concentration in exhaust gas to the greatest extent are manifold vacuum, engine detuning (maladjustment and/or poor mechanical condition), and cold as compared to hot engine starting. Manifold vacuum of more than approximately 21.5-in. Hg (mercury) accounts for high concentrations of hydrocarbons during deceleration. This effect is accentuated by high speeds at the start of deceleration and by manual transmissions as compared to automatic transmissions. Accelerating and cruising conditions at various engine speeds produce similar hydrocarbon concentrations, generally in the range of 1 per cent to 5 per cent of the supplied fuel, with hydrocarbon concentrations tending to decrease with increasing engine speed. Enriched carburetor idle setting increase hydrocarbon emission during cruise up to approximately 30 mph. One misfiring plug may more than double the average hydrocarbon concentration. A deposit -fouled spark-plug set can increase the rate of hydrocarbon emission moe than 2 1/2 time during a wide-open-throttle acceleration. Among variables which affect oxides of nitrogen, air-fuel ratio is of primary importance. Lean mixtures promote the formations of oxides of nitrogen and increase the relative effects of other engine variables. Under full throttle, rich mixture conditions, concentrations of oxides of nitrogen are relatively low. Under part-throttle conditions, however, mixtures are sufficiently lean to permit varying degrees of importance to be attached to ignition timing advance, manifold pressure increase, and compression ratio increase, all of which promote oxides of nitrogen formation. Under road-load cruise conditions and during full-throttle accelerations, higher speeds produce higher concentrations. During part-throttle accelerations , there is no general effect of speed, and high concentrations may be exhausted even at low speeds. During idling and deceleration, oxides of nitrogen concentrations are so low as to be considered insignificant.##

05312

Chironis, N. P.

SMOG: THE DEADLY POISONS PERIL LIFE IN ALL CITY AREAS. Prod. Eng. 37, 33-41 (Dec. 19, 1966).

The air pollution problem is national in scope. Pollution-control officers continue to make a point of cracking down on offending factories, power stations, and incinerators. But, behind the scenes, the case against automotive contaminants is building up, and nothing less than a revolution in automotive engineering will satisfy tomorrow's standards. This design revolution is chartered for three stages: Modification of existing engines--improved carburetors, timing systems, cylinder-head design--and the addition of devices to burn off hydrocarbons and noxious gases. A search for new types of internal combustion engine--fuel injection engines, improved gas turbines, rotary engines. Entirely new propulsion systems that don't use fossil fuels--electric cars with batteries or fuel cells, linear motors for mass transportation systems, perhaps nuclear power either indirectly to charge batteries or directly to drive vehicles. It was indicated that pollutants from all sources amount to 135 million tons a year. So motor vheicles account for about 60 percent of the nation's atmospheric wastes, by weight. Moreover, government figures indicate that vehicles are responsible for about 97 percent of the olefin hydrocarbons and 40 percent to 60 percent of the nitrogen oxides. Controls are aimed at three specific targets: emissions from the tailpipe, from crankcase ventilations, and from carburetor and gas tank evaporation. The tailpipe is by far the greatest source of emissions, accounting for up to 65 percent of the hydrocarbons and almost all the carbon monoxide and nitrogen oxides. But the crankcase emission is the easiest to control, and California chose it as the first target six years ago. These allow 275 ppm of hydrocarbons and 1.5 percent carbon monoxide by volume. Effective Jan. 1, 1970, however, California will cut these allowables to 180 ppm hydrocarbons and 1 percent CO. The state is also considering a proposal to adopt a standard of 350 ppm of nitrogen dioxide.

05337

G. G. Esposito

IDENTIFICATION OF AEROSOL PROPELLANTS IN PAINT PRODUCTS BY

GAS-LIQUID CHROMATOGRAPHY (FINAL REPT.) Army Coating and Chemical Lab., Aberdeen Proving Ground, Md. (Rept. No. 226.) Mar. 1967. 15 pp.

Aerosol packaged paint products have gained widespread acceptance in recent years. Because of safety and toxicity factors, the type of propellant employed is of vital importance. This report describes a rapid, specific procedure for the identification of propellants using gas-liquid chromatography. A chilled can of paint is sprayed into a test tube and the atmosphere above the liquid is sampled. The analysis is conducted on silicone grease and porous polymer columns. (Author abstract)##

05379

INDUSTRIAL AIR POLLUTION CONTROL. Heating, Piping, Air Conditioning 39 (3), 179-94 (Mar. 1967).

This report reflects present thinking and progress in industrial air pollution control, beginning with the problems, especially those stemming from sulfur dioxide, nitrogen oxides, and fly ash emissions and ending with how these problems are faced in various industries today. A comprehensive list of industrial pollutants with corresponding manufacturing sources, typical industries in which they occur, and damaging effects they cause to humans, animals, plants, and property is presented. Control of particulates, equipment selection considerations, and general problems concerning air quality criteria and standards are reviewed. A table depicting particulate emissions before collection from three major sources (utilities, industry, and residential) for the years 1940, 1960, 1980, and 2000 and the amount of emissions from the four types of firing (pulverized coal, stoker coal, cyclone coal, and oil) expressed in millions is included.

05411

E. S. Starkman

VARIOUS COMPONENT GASES OF ENGINE GENERATED POLLUTION POSE DIFFERING HEALTH HAZARDS. S.A.E. (Soc. Automot. Engrs.) J. 75, (3) 85-7, Mar. 1967

Unburned hydrocarbons, oxides of nitrogen, carbon monoxide, and carcinogens are among the emissions generated by engines. Each produces hazards of varying importance and each presents a different control problem. For example, the ultimate method of reducing the hydrocarbon emissions is to supply a completely stratified charge. As with the hydrocarbons, many engine variables influence the concentration of nitric oxide. Carbon monoxide concentration follows directly the fuel-air ratio, and a rich mixture operation must be avoided at all times. Reduction in carcinogen content should occur as the concentration of unburned hydrocarbons is reduced.##

C5477

F. Gasiorowski

(ENERGY GENERATION FROM LIQUID FUELS.) Energieerzeugung aus fluessigen Brennstoffen. Gesundh. Ingr. (Munich) 86 (4), 116-22 (Apr. 1965.) Ger.

Air pollution due to oil-fired installations is caused by sulfur dioxide, carbon dioxide, nitrogen oxides, and products of incomplete combustion (carbon monoxide, hydrocarbons, ashes, and soot). Percentual share of these agents in flue gases produced from different fuel oils under various combustion conditions is giben. Efficiency of high smoke stacks in dispersing SO2 is discussed and presented graphically. Statistical data are presented on share of automobile engines, domestic furnaces, and industrial furnaces in cities' air pollution due to SO2.##

05479

A. Goetz

AEROSOL FORMATION IN NATURAL AND POLLUTED AIR. (Aerosolbildung in naturlichen und verunreinigten Luftmassen.) Preprint. Ger. Tr. (Presented at the Internationales Immissionsschutz Forum, Essen, Germany, 1966.)

The nature, type, and the effects resulting from modifications by aerosols of reactive gaseous constituents contained in the biosphere are reviewed. Aerosols modify the physical as well as the chemical reaction pattern of the molecular-disperse gaseous phase to a considerable degree in spite of the fact that the total mass of this colloid substance is minimal 10 to the minus 7th to 10 to the minus 8th compared to that of the gases which suspend the colloids. The increase in concentration of aerocolloids becomes obvious through a rapidly increasing visibility restriction due to contrast reduction by light scattering should also be considered. The growth of aerosols demonstrates the presence of reactive emission components by increased haze formation. It also has to be realized that the origin of the haze production is not necessarily tied to the locality of the pollution source because such reactions proceed relatively slowly, especially when different reaction partners originate at different localities or when a high particulate level is already present due to climate conditions. The formation of aerocolloids is by far not restricted to industrial and other man-made pollutions but results also from many processes in nature which go on continuously over the earth's surface in large variety. Consequently the final effect of emissions depends to a large extent on the geographical and climatic conditions and the natural aerosol levels, so that knowledge about their origin and formation rate is necessary to judge the final effect of various emission types over specific population areas. The sources, chemical and physical interactions , and methods for determining the size distribution of aerosols are considered.##

05527

Meyer, W. E.

CONTROLLING ODOR AND SMOKE FROM DIESEL EXHAUST. Proc. Sanitary Eng. Conf., Air Resources Planning Eng., Pittsburgh, Pa., 1965, pp. 41-54.

To the public the distinguishing features of a diesel engine are its smoke and its odor. Neither has been proven to be connected with any direct or indirect effect of diesel exhaust on the health of man or beast, nor damage to plant life or property. Diesels do not emit significant amounts of either carbon monoxide or hydrocarbons. The only noxious emission of any consequence with which diesels can be charged are nitrogen oxides. Diesels can be built and adjusted not to smoke but this would mean accepting less output from a given engine. It has become customary in the industry to set the maximum engine output so that the exhaust smoke does not excede No. 2 on the Ringelman chart. There is no way of preventing diesel smoke once and for all. It can be controlled and there are numerous devices, means, methods and procedures for controlling it. The real cure is, therefore, to legislate that diesels shall not emit smoke above a certain density and leave it to engine, accessory and fuel manufacturers, owner, operator and driver to decide among and for themselves how compliance with the law is to be obtained.

05599

J. Harkins and J. K. Goodwine

OXIDES OF NITROGEN IN DIESEL EXHAUST. J. Air Pollution Control Assoc. 14, (1) 34-8, Jan. 1964.

Equilibria NO-NO2 values for air-fuel ratios of 20, 25, and 30 at temperature-pressure conditions which bracket true engine conditions were obtained from diesel exhaust analyses. Even at the temperature of 4950 deg F, the NO2 values were only 40 to 80 ppm. The corresponding NO values were an order of magnitude higher than those found in an operating engine. Both NO2 and NO concentrations decreased as temperature decreased, so that at intermediate temperatures, more in line with engine temperatures, very low NO2 values are to be expected. In the tests, truck engines were run on a chassis dynamometer. Both four-stroke cycle and two-stroke cycle engines were included.
Both the total oxides of nitrogen and NO2 were determined by an UV SPECTROPHOTOMETRIC method. The exhaust probe was a 1/4-inch stainless steel line inserted into the exhaust stream. The exhaust was passed through an ice water condensate trap, then through two loosely packed glass wool filters, and was then pushed directly into the UV spectrophtometer by a carbon vane pump. Nitric oxide concentrations were 1100 ppm or less depending on engine load. No NO2 concentrations greater than 60 ppm were found. Higher values can be obtained when the exhaust flow is interrupted and held in a sampling system. Extreme care must be taken in handling diesel exhaust if correct measurements for NO2 are to be made. Also, it was found that NO2 emissions in diesel engines are much lower than reported by others and are, in fact, more in line with equilibrium predictions.##

05649

Smith, I. D.

NITROGEN TETROXIDE DISPOSAL UNIT COMBUSTION PRODUCTS. National Aeronautics and Space Administration, Las Cruces, N. Mex., Manned Spacecraft Center. May 1967. 7pp. (Rept. No. NASA TN D-3965.)

A test program was conducted to determine the identity of the combustion products released to the atmosphere by the vapor disposal units which dispose of nitrogen tetroxide by burning with propane. The burner unit, which is designed to dispose of at least 10 lb of nitrogen tetroxide per minute, consists of an injector system for the propane and the nitrogen tetroxide, a mixing chamber, a burner head constructed to minimize flashback, and a spark-plug igniter system controlled from a blockhouse. Samples of the combustion products were collected and analyzed by infrared spectroscopy. When the unit was operated in the normal, slightly fuel-rich mode, the detectable combustion products were carbon dioxide, water vapor, and unburned propane or other carbon-hydrogen bond-containing materials. The hydrocarbon emission, which would be undesirable in a smog-prone area, can be controlled to a degree by adjustment of the propane feed. The propane adjustment becomes important when disposing of an oxidized feed that continuously diminishes in nitrogen tetroxide. The combustion products do not contain any materials which present any toxicity problems. After a year of usage, the White Sands Test Facility concludes that the disposal units provide a convenient, rapid, and safe method for the disposal of excess nitrogen tetroxide.

05746

Ourusoff, L.

CLEANER AIR AND THE GAS INDUSTRY (PART I). Am. Gas J. 194 (3), 32-5; 38; 40; 42 (Mar. 1967).

The background of air pollution is briefly reviewed from both a universal and a gas industry viewpoint. The principal causes and sources of air pollution in the United States are discussed. The physiological effects of air pollution are considered. Current methods and means of controlling air pollution are reviewed. Regional aspects of the problem are examined as they affect its severity and bear on the attitudes of the public, the federal and local authorities, commerce, and industry, and more specifically the public utility companies.

05815

C. G. Segeler

THE GAS INDUSTRY AND ITS CONTRIBUTION TO AIR POLLUTION CONTROL. Preprint. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

Two facts are demonstrated here: first that the use of natural gas produced negligible air pollution if any; and second that natural gas is available under such economic conditions that its use will expand. Beginning with the first fact, the constituents of natural gas are discussed. A trace constituent of primary concern in utility delivered gas (97% natural gas) is sulfur which is the result of an odorant added for the detection of gas. Sulfur is present at a concentration of approximately six parts per million. Total sulfur in the combustion products of a million lbs. of natural gas amounts to only 37 lbs. The formation of NO at high flame temperatures and its subsequent oxidation to NO2 at lower temperatures is not an intrinsic fuel property but is influenced by the conditions of combustion. Values for residential, industrial and commercial production of nitrogen oxides by combustion of natural gas are given, based on utility company gas distribution. Information on emission of nitrogen oxides vehicles is given as a frame of reference. Application of laboratory investigations of emissions from equipment and their interpretation are discussed. A proposed plan for improving industrial safety using group organization with annual inventories and reports is discussed. The following specialized application of gas in air pollution control are discussed: (1) domestic incineration, (2) destroilet, (3) flue fed apartment incinerators, (4) industrial boiler plants, and (5) commercial and industrial incinerators. Application in smoke control by reclaiming operations, research on an appliance for consuming kitchen grease vapors; and catalytic fume oxidation systems are discussed. As for the availability of natural gas, a brief survey of its consumption and reserve statistics is presented.##

05850

M. A. Elliott, G. J. Nebel, and F. G. Rounds

THE COMPOSITION OF EXHAUST GASES FROM DIESEL, GASOLINE AND PROPANE POWERED MOTOR COACHES. J. Air Pollution Control Assoc. 5 (2), 103-8 (Aug. 1955). (Presented at the 48th Annual Meeting, Air Pollution Control Association, Detroit, Mich., May 22-26, 1955.)

Exhaust-gas samples were obtained from Diesel, gasoline, and propane-powered motor coaches of similar passenger capacity under idling, accelerating, cruising, and decelerating driving conditions. The samples were analyzed for carbon monoxide, oxides of nitrogen, formaldehyde, and hydrocarbons. In addition, the exhaust-gas flow rates were measured to permit calculation of the emission rate for each constituent at each driving condition. Based on a typical city driving pattern, it was concluded that:
1. The carbon monoxide emission from the Diesel coaches was only a small fraction of that from the gasoline and propane coaches.
2. The differences observed in the emission of oxides of nitrogen, formaldehyde, and hydrocarbons by the 3 coach types were relatively small. No one coach type discharged either the greatest or least amounts of all of these 3 constituents.##

05864

S. S. Griswold, R. L. Chass, R. E. George, and R. G. Holmes

AN EVALUATION OF NATURAL GAS AS A MEANS OF REDUCING INDUSTRIAL AIR POLLUTION. J. Air Pollution Control Assoc. 12 (4), 155-63, 208 (Apr. 1962). (Presented at the 54th Annual Meeting, Air

Pollution Control Association, New York City, June 11-15, 1961.)

Fuel oil burning contributes greatly to the total atmospheric loading of significant air contaminants. Fuel oil also is a major source of oxides of nitrogen, an important participant in photochemical smog occurrences and a toxic substance in itself. The cleanliness of the atmosphere is affected by the aerosols emitted directly from fuel oil burning sources and particularly by such large fuel users as power plants. The presence of sulfur dioxide greatly increases the amount of aerosols created by the photochemical reactions between hydrocarbons and oxides of nitrogen. Burning fuel oil acts in three ways to impair the visibility: (1) it emits aerosols directly; (2) it emits oxides of nitrogen to take part in the photochemical reaction; (3) it provides sulfur dioxide to help make these photochemical reactions more potent producers of still more aerosols. In addition to the deleterious effects on visibility, fuel oil burning results in (1) esthetically offensive opacity violating plumes, and (2) damage to vegetation. The contribution by power plants to these typical manifestations of smog in Los Angeles County would measurably be reduced by the substitution of natural gas in place of fuel oil.##

05893

J. V. Scaletti, C. E. Gates, R. A. Briggs, L. M. Schuman

NITROGEN DIOXIDE PRODUCTION FROM SILAGE. I. FIELD SURVEY. (Agron. J.) 52, 369-72 (1960).

Since exposure to silage gases constitutes a distinct occupational hazard to farmers, a study was undertaken to determine the extent and frequency of NO2 production from silage in Minnesota through a state-wide silage survey and to relate, if possible, production of this gas with various agronomic practices and environmental conditions existing during the period of the study. In the survey (1957 and 1958) 1,219 questionnaires were completed for individual silage crops. Actual objective NO2 determinations were made shortly after filling time on 332 silage crops. The remaining 887 (mail) questionnaires were presumably biased and consequently were not weighted heavily. NO2 gas was found in 42% of the 332 silos in the detailed study. The presence or absence of NO2 was found to be significantly related to county for corn and oats as well as for both years. Those counties with the heavier soils showed a greater response rate. The level of organic matter and potassium present in the soil at the time of ensiling affected NO2 production consistently over crops and years for organic matter, but to a lesser extent for potassium. The higher the amount of organic matter, the greater the number of positive tests for NO2 obtained. Intermediate levels of available potassium ion in soil appeared related to NO2 production. Although not as clearly demonstrable, lower levels of phosphorus led to an excess of positive tests for NO2. Only 1 of 21 silos containing sodium metabisulphite as a preservative showed evidence of NO2 production. No relationship to the objective measure of the production of NO2 was shown by the following factors: crop, amount and method of application of other preservative, amount of organic (manure) or inorganic fertilizer added to the soil at time of planting, crop condition, time elapsing after cutting before ensiling, and method of chopping. (Author summary modified) **

05912

Larsen, R. I.

MOTOR VEHICLE EMISSIONS AND THEIR EFFECTS (CONFERENCE REPORT). Public Health Rept. (U.S.) 77(11), 963-9 (Nov. 1962) (Presented at the Annual Meeting, New England Section, Air Pollution Control Association, Worcester, Mass., April 25, 1962.)

Highlights of the papers presented at the Fifth Air Pollution Medical Research Conference on December 4, 1961, and at the Joint Research Conference on Motor Vehicle Emissions and Their Effects on December 5-7, 1961 are presented. Current research findings on quantities and types of air pollutants from motor vehicles and the effects of these pollutants on the health of man, plants, and laboratory animals are reviewed.

05970

T. J. Connolly and K. Nobe

INCINERATION STUDIES: FORMATION OF OXIDES OF NITROGEN IN GAS FIRED HEATERS. (In: First report of air pollution studies.) ((California Univ., Los Angeles, Dept. of Engineering.)) (Rept. No. 55-27.) (July 1955). 29 pp.

The results are presented of an investigation of the possibilities of reducing the production of these oxides. A review of the thermodynamics and kinetics of oxides of nitrogen formation and decomposition has been made. Measurements of the concentration of these oxides in the flue gases of a household gas-fired water heater were made. Experiments were performed to collect data on possible variation in oxide concentration within the flue pipe of the heater. The principal constituent of oxides of nitrogen within a heater or furnace appears to be nitric oxide, NO. This compound is probably oxidized to nitrogen dioxide, NO2, in the atmosphere. Equilibrium concentrations of these oxides in flue gases at various temperatures have been calculated and are presented. Measurements made in this work, as well as in previously published information, show that the actual concentration of oxides of nitrogen are far in excess of equilibrium concentration. The water heater tested here emitted about 8 pounds of oxides per ton of fuel. A study of some reaction rate data indicates that the formation of nitric oxide at flame temperatures can be explained by the homogeneous reaction kinetics. It appears, however, that any decomposition that may occur at lower temperatures must be surface-catalyzed or heterogeneous since the homogeneous reaction rates would not account for significant decomposition. The data obtained on measurements of oxides of nitrogen concentration at various points in the flue pipe of the water heater did not furnish conclusive evidence of any change. (Author summary modified) **

06031

E. F. Lemke, N. R. Shaffer, J. A. Verssen, and R. G. Lunche

AIR POLLUTION FROM AIRCRAFT IN LOS ANGELES COUNTY - A REPORT OF THE ENGINEERING DIVISION, DEC. 1965. 90th Congress. pp. 248-61. ("Air Pollution-1967, Part I (Automotive Air Pollution)" Senate Committee on Public Works, Washington, D. C., Subcommittee on Air and Water Pollution, Feb. 13-14, 20-21, 1967.

The amount of air contaminants emitted into the atmosphere of Los Angeles County as the result of the operation of aircraft was surveyed. The emissions from aircraft with which the District is concerned are those occurring below 3,500 feet altitude and within the geographical boundaries of Los Angeles County. This altitude (3,500 feet) is used as a parameter for the mixing height below which atmospheric dispersion of pollution is inadequate. Observations were made from airport control towers to establish the average time duration of the various operational flight phases for different types of aircraft. These phases are: (1) Taxiing from the terminal to the end of the runway and idling while awaiting clearance from the control tower; (2) Take-off and climb-out through 3,500 feet altitude; (3) Descent from 3,500 feet altitude to touchdown on the runway; and (4) Taxiing from touchdown to the unloading terminal. In observing the departure phase, radio contact was maintained with the pilot in order to learn when the aircraft had climbed-out to 3,500 feet altitude. The distance in miles from the airport when the aircraft was at 3,500 feet altitude was established by radar for both arrival and departure. In the arrival phase, the pilot notified the control tower as the aircraft descended downward through 3,500 feet altitude. It was thus possible to determine the average elapsed time for an aircraft to travel from take-off to 3,500 feet altitude, and from 3,500 feet altitude to touchdown on the runway. Emission factors were then applied.##

06039

K. J. Springer

INVESTIGATION OF DIESEL POWERED VEHICLE ODOR AND SMOKE - PART 2 (MONTHLY PROGRESS REPT. NO. 4, APR. 15, - MAY 15, 1967). Southwest Research Inst., San Antonio, Tex., Vehicle Emissions Research Lab. (May 26, 1967) 12p.

Studies of the effect of engine derating on exhaust smoke and odor are in progress. The 6-month fleet test of a smoke suppressant additive, which began on April 1, is continuing. Preparations for the evaluation of the three types of catalytic mufflers for use with two-cycle powered buses are nearing completion. Preliminary studies are under way to establish the feasibility in the laboratory of relating an instrumental odor measurement method with the human odor panel.##

06055

HEALTH PROBLEMS RESULTING FROM PROLONGED EXPOSURE TO AIR

POLLUTION IN DIESEL BUS GARAGES. Ind. Health (Japan) 4(1): 1-10 (1966).

An environmental and a health survey of two diesel bus garages in Alexandria (Egypt) have shown an air pollution problem due to the exhaust of engines containing SO2, NO2, aldehydes and hydrocarbons within permissible levels and a relatively higher concentration of smoke. The examination of workers revealed the occurrence of upper respiratory tract disease, chronic bronchitis, asthma, peptic ulcer, gastritis, and high blood pressure in prevalences higher than expected. Respiratory diseases were probably due to a synergistic effect of smoke and irritants as well as the presence of acrolein and adsorbed hydrocarbons and the smoking habits of workers. Cases of chronic dyspepsia and peptic ulcers were probably related to the nervous tension of night shifts, and other factors as the irregularity of meals and the probable swallowing of dissolved irritants. The blood pressure was relatively "higher" among night shift workers. (Authors' abstract, modified)##

06086

R. I. Stenburg, R. R. Horsley, R. A. Herrick, A. H. Rose, Jr.

EFFECTS OF DESIGN AND FUEL MOISTURE ON INCINERATOR EFFLUENTS. J. Air Pollution Control Assoc. 10 (2), 114-20 (Apr. 1960). (Presented at the 52nd Annual Meeting, Air Pollution Control Association, Los Angeles, Calif., June 21-26, 1959.)

Tests were made to determine the effects of fuel moisture content on pollutant emissions from an experimental incinerator of fixed dimensions while varying (1) the amount and distribution of combustion air, and (2) the burning rate as measured by the amount of fuel charged per hour. Overfire combustion air was introduced into the front of the ignition chamber at the grate level, and swept the surface of the burning fuel bed. Underfire air entered through the ash pit and passed up through the fuel bed. Secondary air was introduced through a duct built into the top of the bridge-wall and was discharged through a series of ports opening into the top of the mixing chamber. Dry components of the fuel include equal parts, by weight, of newspaper and corrugated cardboard, mixed in a ratio of three to one with wood chips. Chopped potatoes were substituted for leafy vegetables as the wet component because of their year-round availability. Five-pound charges were prepared with the wet-to-dry components adjusted to provide a fuel with an average moisture content of either 25 or 50%. Particulate, oxides of nitrogen, hydrocarbons, carbon monoxide, and smoke were measured. Because of the basic physical and chemical laws involved, factors demonstrated by this study as affecting the increase or decrease of air pollutants should be the same as those affecting production of pollutants from larger scale incinerators.##

06104

Swartz, D. J., K. W. Wilson and W. J. King

MERITS OF LIQUEFIED PETROLEUM GAS FUEL FOR AUTOMOTIVE AIR POLLUTION

ABATEMENT J. Air Pollution Control Assoc. 13 (4), 154-9 (April 1963). (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

The purpose of this investigation is to establish trends and to present some material which sould be both interesting and revealing as regards the use of LPG as a motor fuel. Particular emphasis is directed towards its potential for reducing atmospheric air pollution. A major result of this investigation is to provide new data emphasizing the striking differences in the composition of exhaust gas from similar engines operating on Liquefied Petroleum Gas fuel as contrasted with their operation on gasoline. Tests show that in the case of LPG exhaust there are essentially no heavy hydrocarbons (C4 or greater) present. Since the olefins are the worst offenders as regards smog formation from gasoline exhaust, the absence of heavy olefins in LPG exhaust suggests the possibility of a significant reduction in automotive smog if enough vehicles in a given area use LPG fuel. The scaled fuel system offers an additional advantage by eliminating the evaporation of fuel to the atmosphere, which is currently a source of added expense to the motorist as well as adding to the total amount of air pollution from cars.

06280

Folke Hedlund, Gustav Ekberg, Sten Erik Mortstedt

DIESEL EXHAUST GASES. INVESTIGATION WITH PROPOSALS FOR ACTION. (Communications Dept., Stockholm, Sweden, Guidance Group Concerning Development Work in the Field of Motor Vehicle Exhaust Gas, Sept. 1967. Translated from Swedish. Joint Publications Research Service R-8943-D, 74p., Dec. 12, 1967. 27 refs.

Diesel exhaust emissions and methods of controlling these emissions in Sweden are reviewed. The diesel engine differs from the gasoline engine in several respects, which have a decisive influence on the pollution it emits. It uses a fuel that is less volatile than gasoline. It normally works with a higher excess of air (leaner mixture) and the devices for feed and ignition of the fuel are quite different. Due to the discharge by individual vehicles of dense smoke and by the discharge of foul-smelling substances they have been pointed out by the public as qualified air polluters. Poor maintenance of the engine or intentionally wrong pump adjustments can result in the giving off of such dense smoke that this can constitute a hazard for overtaking vehicles due to impaired or obscured visibility. Diesel engines can give off various types of smoke. One type is the heavy load smoke, which arises through load on a hot engine. Exhaust gases from diesel vehicles, especially under certain driving conditions, contain substances that are irritating to eyes, nose and throat. These include: oxides of nitrogen, hydrocarbons, polycyclic aromatic hydrocarbons, carbon monoxide and sulfur dioxide. The smoke from a diesel engine can be limited by various measures, undertaken on the engine or the fuel pump, the fuel, and finally on the exhaust gases. Regular maintenance of the engine is necessary to keep the smoke values at the lowest possible level. Current and proposed regulation of diesel exhaust emissions are discussed.**

06299L

Bureau of Mines, Pittsburgh, Pa., Coal Research Center
pp. 51-61 (1966).

FLAME CHARACTERISTICS CAUSING AIR POLLUTION. (SECTION VI OF AIR POLLUTION RESEARCH PROGRESS REPORT FOR QUARTER ENDED DECEMBER 31, 1966.)

A study is in progress of the factors that lead to or limit emission of oxides of nitrogen, carbon monoxide, and light hydrocarbons by gas appliances, such as space heaters and hot water heaters. The separate and combined effect of thermally or chemically perturbing the combustion gases above primary flames of lean, stoichiometric, and rich propane-air mixtures are being determined theoretically and also experimentally by means of factorial experiments. Concentrations of oxides of nitrogen with and without flue gas were determined at sampling stations at the top of the primary flames and concentration of oxides of nitrogen was reduced by the addition of either of two simulated flue gases. Flue gas A (containing no air) was more effective in reducing the concentration of oxides of nitrogen than flue gas B (containing air). The data also indicate that for most of the flames with or without flue gas the major increase in concentration of oxides of nitrogen occurred within about the first inch above the primary flames. The effect of addition of flue gas on concentration of hydrocarbons was measured at the top of the primary combustion zone. Hydrocarbons occurred at the edge of all flames when a flue gas was added. Since the addition of flue gas caused partial flame lift it is possible that some of the initial hydrocarbon plus other hydrocarbons formed from it may be escaping through the dead space between the burner grid and the base of the flame. (Author's summary, modified)##

06300L

CHARACTERISTICS AND PHOTOCHEMICAL REACTIVITY OF VEHICULAR EMISSIONS. (Section VII of air pollution research progress report for quarter ended December 31, 1966.) Bureau of Mines, Pittsburgh, Pa., Coal Research Center, 1966, pp. BM/63-BM/67.

The effects of halogens, SO2, and humidity on reactivity of a standard ethylene plus NO plus air mixture were studied. The results showed no effects on the system's chemical reactivity as a result of the presence of halogen and SO2; the ozone meter's response to oxidant and NO2, however, was reduced in the presence of SO2. Humidity was found to interfere with the chemical processes in a way that affected significantly the reactivity-measuremnt results. Further studies on background reactivity in the irradiation chamber showed that the background oxidant formation result of photochemical reactions involving NOx and hydrocarbon at extremely low concentrations. (Author summary)##

06335

Little, (Arthur D.) Inc., Cambridge, Mass. (Rept. C-62653.) (May 30, 1960). 106 pp.

THE PROBLEMS OF TOXICITY, EXPLOSIVITY, AND CORROSIVITY ASSOCIATED WITH WS 108A-2 MARK II OPERATIONAL BASE FACILITY. Little (Arthur D.) Inc., Cambridge, Mass. (Rept. C-62653.) (May 30, 1960). 106 pp.
DDC: AD 450048

A review was made of problems regarding toxicity, explosivity, and corrosivity of a missile fuel as they affect the design of a Silo Launch Test Facility and Silo Launch Operational Base. Recommendations are made concerning breathing apparatus, clothing, detection, water for fire fighting, degradation of propellant and use of materials to minimize corrosivity. (Author abstract)##

06781

(PRESERVATION OF AIR PURITY AND THE PRODUCTION OF POWER.) Maintien de la Purete de l'Air et Production d'Energie. Centre Interprofessionnel Technique d'Etudes de la Pollution Atmospherique, Paris, France. (1967.) 4 pp. Fr. (Rept. No. CI 306.) (C.I.T.E.P.A. Document No. 24.)

After a joint meeting of three German and three American experts on air pollution from large boilers and other sources, the problem of pollution was discussed with representatives of the Ministry of Labor and Social Affairs and the owners of large boilers in the State of North Rhine-Westphalia, in West Germany. The differences in approach, the climatic conditions, the size of the country, and the type of regulatory authority were explored. Various controls were investigated such as the use of high stacks, low-sulfur fuels, sulfur dioxide removal, and electrostatic precipitators. There is a short discussion of smog formation in California by photochemical action. In Germany, federal law governs the regulation of air pollution. Also in Germany, federal law governs the regulation of air pollution. Also in Germany the regulations cover individual parts of the installations, while in the United States the main consideration is the concentration of the pollutant in the ambient air produced by the installation.
While investigations into the elimination of pollution continue, reliance on high stacks is suggested.##

06791

P. Lemaigre

AIR POLLUTION BY MOTOR VEHICLES. LA POLLUTION DE l'Air par les Vehicules Automobiles. Pollut Atmos (Paris) 8, (32) 439-82, Dec. 1966. Fr.

A general review is presented of the air pollution caused by motor vehicles. The known facts and the current research on air pollution is presented on the basis of papers given before the Strasbourg Conference in June of 1964. The various polluting agents are considered and the control measures which involve the fuels and the engines are described. Recent work carried out in both France and the United States is discussed with the differences between the motor traffic conditions taken into account. French legislation is discussed emphasizing the importance of proper engine maintenance in air pollution control. The results of proper carburetor adjustment during idling are a good example of a simple method of control. It is concluded that the eventual solution will not be easy. The necessity of preserving "green areas" as method of air pollution control is brought out since these plots have a considerable absorbent role.##

06967

PREVENTION OF AIR POLLUTION IN THE STATE OF NORTH RHINE-WESTPHALIA. Ministry of Labour and Social Welfare, North Rhine-Westphalia, Germany)). (Report to the Congrss on the "Prevention of Air Pollution", Duesseldorf, Germany, Apr. 5-7, 1965.) 78p. Translated from German.

A survey of the activities in North Rhine-Westphalia for the prevention of air pollution is reported and the results are summarized. The report included: (1) history, legal basis, administrative organization, smogwarning network, and economic problems; (II) Report of the Factory Inspection Dept. (Enterprises subject to approval and other enterprises and working places); and (III) report of the State Institute for Air Pollution Control and Land Utilization (monitoring of air pollution, techniques for measuring immissions, relationship between emission and immission, technical steps for the restriction of emissions, and the effect of air pollution on soil, vegetation and animals.##

07178

Doyle. G. J. and N. A. Renzetti

THE FORMATION OF AEROSOLS BY IRRADIATION OF DILUTE AUTO EXHAUST. J. Air Pollution Control Assoc., 8(1):23-32, May 1958. 17 refs. (Presented at the 132nd Nat. Meeting, Amer. Chem. Soc., New York, N.Y., Sept. 8-13, 1957.)

Laboratory examinations of diluted auto exhausts were used in the study as a method of determining whether aerosols form as a consequence of photochemical reactions which are induced to occur in this medium. The system used allowed investigation of the dependence of aerosol formation on the composition of the dilute exhaust and the determination of some of the properties of the generated aerosol. The controlled variables were the concentrations of four types of exhaust (idle, acceleration, cruise, and decleration), relative humidity, temperature during irradiation (27 plus or minus 2C), and light intensity (near ultraviolet which is comparable to noon sunlight on a winter day).

The aerosols in the exhaust-air mixtures were studied by means of a counter photometer and a nuclei counter. Aerosol can be formed by irridiation of dilute auto exhaust. Within the range of concentrations studied, aerosol formation is favored by increasing the concentration of deceleration exhaust, and, to a lesser degree, by increasing the concentration of oxides of nitrogen. The aerosol so formed is in the submicron size region but is of sufficient concentration and size to reduce visibility appreciably and to increase the mass concentration of aerosol.##

07223

E. Fiala and E. G. Zeschmann

THE EXHAUST GAS PROBLEM OF MOTOR VEHICLES. (Part 1). Zum Abgasproblem der Strassenfahrzeuge. (Teil 1). Automobiltech. Z. (Stuttgart) 67(9), 302-8 (Sept. 1965). (Ger.)

The various pollutants in exhaust gases and their origins are reviewed. The effects of mixing ratios, lubricants, evaporation from tanks and possibilities for reducing the amounts of harmful emissions are discussed. Among other measures, fuel injection and catalytic afterburners are mentioned. The exploration of new forms of energy storage and conversion are discussed. Fuel cells, and primary and secondary batteries are discussed. As a criterion kg/hp, is used.##

07230

K. Horn

(AIR POLLUTING FUELS FROM THE VIEW POINT OF HEALTH PROTECTION OF THE POPULATION IN RESIDENTIAL AREAS.) Luftverschmutzende Energietrager unter dem Aspekt des Gesundheitsschutzes der Bevolkerung in Wohngebieten. Z. Ges. Hyg. Grenzg. (Berlin) 13 (1), 30-4 (Jan. 1967). (Ger.)

A survey of the carriers of thermal energy specific for Germany, particularly considering solid fuels on the brown coal basis, is presented. A study was made of the effect of these household fuels on air pollution throughout Germany. Frequently, the maximum allowable concentrations of pollutants, especially SO2, are exceeded. The importance of ashes, sulfur compounds, nitric oxides, and benzopyrene as pollutants is emphasized. Epidemiological studies show the existence of correlations between high concentrations of air pollution and occurrence of diseases of the upper respiratory tract. The possibility of changing to a distant heat supply by block heating stations or long-distance heating stations is discussed. The type of fuel is of considerable importance. Values for maximum allowable concentration should be strictly adhered to by technical planners. (Author's summary, modified)##

07451

Scharf, P. B., B. B. Goshgarian, H. M. Nelson, and G. L. Hody

THE MEASUREMENT OF THE EXHAUST COMPOSITION OF SELECTED HELICOPTER ARMAMENT. Air Force Rocket Propulsion Lab., Edwards AFB, Calif. and Army Aeromed. Res. Unit, Fort Rucker, Ala., Proj. No. 3A0 2560 1A 819, Task No. 051, Rept. No. AFRPL-TR-67-203 and USAARU-67-10, 46p., June 1967. 4 refs.

A study of the exhaust composition of rapid fire machine guns and rockets has been conducted. Methods of analysis were evaluated and exhaust compositions for the 50 cal and 7.62mm machine gun and the 2.75" rocket were determined. A rapid scan infrared spectrophotometer was used for immediate examination of effluent gases in order to detect reactive species. The exhaust gases were analyzed at concentrations as high as 1000 times those present in helicopters to minimize the chance of missing any significant toxic product. A qualitative and quantitative analysis of gas phase and aerosol components is given. It may well be that the proportion of carbon monoxide in the exhaust is so high that permissible exposure times can be selected on the basis of its concentration alone while still limiting exposures to all other toxic materials to safe leevls. However, significant amounts of nitrogen dioxide, ammonia, carbonyl sulfide, hydrogen cyanide, lead and copper were found.##

07546

J. G. Terrill, Jr., E. D. Harward, I. P. Leggett, Jr.

ENVIRONMENTAL ASPECTS OF NUCLEAR AND CONVENTIONAL POWER PLANTS. Ind. Med. Surg., 36(6):412-419, June 1967. 24 refs. (Presented at the 5th Inter-American Conference on Toxicology and Occupational Medicine, Miami, Fla., Aug. 1-4, 1966.)

Inherent difficulties in comparing the health risks of conventional and nuclear power plants are pointed out, and currently available data are presented. Efforts of the Public Health Service to establish the relative health risks of the power sources are indicated. There is a lack of accepted standards for the permissible concentrations of nonradioactive elements in the environment and also a limited amount of data on the exact composition of the atmospheric radioactive releases from operating nuclear plants. In the year 2000, the U.S. power-generating capacity is expected to increase from the present 11 x 10 to the 15th powerBTU/yr to 70 x 10 to the 15th power BTU/yr with the proportion of this capacity provided by nuclear power increasing from 1% in 1966 to 43% in 2000. The production of oxides of sulfur produced by a 1000 MWi power station when fired by coal, oil, or gas is given showing emission rates in million lb. per year of: 306 for coal; 116 for oil; and 0.027 for gas. The generation of electricity in the U.S. is responsible for 15.6 million tons of atmospheric pollutants per year. There are some radioactive materials such as 1.1 ppm of 238U and 2.0 ppm of 232Th in coal. The only case in which a nuclear plant might be close to requiring as much dilution air as a fossil fuel plant to meet the required conditions would be to prevent the contamination of milk by radioactive iodine. The Public Health Service plans to conduct a study of two oil-fired plants and two nuclear plants at the same site to evaluate the environmental release and effects from both types of plants with identical meteorological, hydrological, population, and topographic features.##

07555

Nebel, G. J. and M. W. Jackson

SOME FACTORS AFFECTING THE CONCENTRATION OF OXIDES OF NITROGEN IN EXHAUST GASES FROM SPARK IGNITION ENGINES. J. Air Pollution Control Assoc., 8(3):213-219, Nov. 1958. 7 refs. (Presented at the Symposium on Air Pollution, 132nd Meeting, American Chemical Society, New York, N.Y., Sept. 9-13, 1957.)

The independent effects of air-fuel ratio, spark timing, manifold air pressure, engine speed, and compression ratio on the concentration of oxides of nitrogen in exhaust gases were investigated. Air-fuel ratio was found to be the most important variable. Maximum concentrations of oxides of nitrogen were formed when the air-fuel ratio was one to three ratios leaner than stoichiometric. The lowest concentrations, often only 1% of the maximum values, were found at the richest air-fuel ratios tested. Advanced spark timing, higher manifold air pressures, and higher compression ratios favored the formation of oxides of nitrogen. The importance of these variables depended greatly, however, on air-fuel ratio. They had considerable effect under lean mixutre conditions and little or no effect under rich mixutre conditions. The effect of engine speed was peculiar in that with rich mixtures, increasing speed favored the formation of oxides of nitrogen, whereas with lean mixtures, the opposite trend was found. Engine speed is considered the least important of the five variables investigated. The effect of air-fuel ratio on the concentration of oxides of nitrogen is attributed to changes in oxygen concentration and, to a lesser extent, combustion temperature. The effects of spark timing, manifold air pressure, and compression ratio are believed to be due to their effects on combustion temperature. The effect of engine speed may involve the reaction time. Two possible methods to reduce the emission of oxides of nitrogen from automobiles are pointed out. These involve modifications of carburetion or spark timing.##

07561

Kaiser, E. R., J. Halitsky, M. B. Jacobs, and L. C. McCabe

PERFORMANCE OF A FLUE-FED INCINERATOR. J. Air Pollution Control Assoc., 9(2):85-91, Aug. 1959. 7 refs. (Presented at the 51st Annual Meeting, Air Pollution Control Assoc., Philadelphia, Pa., May 25-28, 1958.)

A limited survey of representative modes of operation and results of one flue-fed incinerator is reported. The tests were conducted to serve as a basis for comparison with fruture tests on identical incinerators with modifications to improve combustion and reduce air pollution. The incinerated refuse from a 128-apartment building was approximately 430 lb. a day. The flue-fed incinerator reduced the apartment refuse to about 37% of its original weight and to about 10% of its original volume. The bulk density of the refuse averaged 4.1 lb/cu ft. in the incinerator. The residue had a bulk density of 15.4 lb/cu ft. in the ash cans. The residue averaged 64% metal and glass, 12% ash, 16% combustible, and 8% moisture, excluding quench water. The air normally supplied to the furnace was 10 to 20 times the theoretical air necessary for complete combustion. The high excess air reduced the furnace temperatures and undoubtedly affected adversely the combustion of volatile matter and emission of fly ash. The infiltration air entering the flue through vents on the service doors and cracks averaged 35% more than entered the furnace. Sealing the vents reduced the infiltration air to the flue to 45% of the furnace air during the period of fast burning. The peak furnace temperatures varied from 970 to 1200 deg F. The emissions of particulate matter to the atmosphere via the flue gases ranged from 0.85 to 1.55% of the refuse weight. The weights of particulate matter ranged from 2.5 to 4.7 lb/1000 lb of furnace gas corrected to 12% CO2. The emission of eight noxious gases totaled 0.9 to 3.0 lb/100 lb refuse. The presence of additional unburned hydrocarbons in the flue gases was confirmed by mass-spectrometer tests. The average odor concentrations ranged from 2.5 to 100 ASTM odor units. The incinerator had inherent features of design and operation that caused high emissions of particulate matter and unburned organic compounds. The charging of refuse during burning could contribute to the discharge of particulate matter. Suggested modifications to the conventional incinerator include control of the furnace air supply, better mixing of air and volatile products from the burning refuse in a zone of high temperature, new furnace designs to eliminate the necessity for hooking and raking the refuse and residue, and residue removal with minimum air flow.##

07593

Panel on Electrically Powered Vehicles

THE AUTOMOBILE AND AIR POLLUTION: A PROGRAM FOR PROGRESS.
Los Angeles County Air Pollution Control District, Calif.,
51p., Oct. 1967.
GPO: 0-278-482

Air pollution problems from the viewpoint of automotive transportation were studied in general and all possible alternatives to the current gasoline engine were investigated by the Panel on Electrically Powered Vehicles. The Panel made sixteen recommendations for the Federal Government with respect to its role concerning air pollution resulting from automotive emissions. Technology and the control of automotive air pollution and the role of industry are also discussed.##

07596L

Styles, H. E., J. Verbos, and J. Lawther

PUBLIC HEALTH ASPECTS OF AIR POLLUTION FROM DIESEL VEHICLES.
Preprint, London Transport, England; Transport
Administration, Brussels, Belgium and Medical Research
Council Air Pollution Research Unit, London, England,
(46p.), 1966. 8 refs. (Paper No. WHO/AP/67.28.)

An indication of the nature of air pollutants which may result from the combustion of fuel, an explanation of the differences between petrol and diesel engines which give rise to the emission of exhaust products having different characteristics, and a comparison between the two types of engines in respect of their propensity to cause pollution of the atmosphere is presented. Evidence derived from medical investigations concerning possible health hazards arising from motor vehicle exhausts is reviewed. An indication is then given as to means whereby satisfactory operation of diesel engined vehicles may be achieved without production of objectionably smoky exhausts. There follows a description of the legislative procedure which one country (Belgium) has introduced in the interests of ensuring that vehicles are so operated as to ensure that they emit no unduly offensive exhaust products and, as an appendix, an outline is provided of measures taken by London Transport to prevent air pollution by diesel-engined public service vehicles. The fact that maladjustment or incorrect operation of a diesel engine almost inevitably leads to the production of an objectionably smoky exhaust has given rise to prejudice against the use of such engines in road vehicles and an ill-informed impression that the exhaust which they emit causes more serious atmospheric pollution than does the exhaust from petrol engines.##

07690

Cominelli, A.

AN EASILY CONTROLLABLE AIR POLLUTION SOURCE: NAPHTHA ENGINES. ((Una fonte di inquinamento atmosferico che e relativamenta facile controllare: i motori a nafta.)) Text in Italian. Ann. Sanita Pubblica (Rome), 28(2):367-375, March-April 1967. 9 refs.

The exhaust from diesel engines (naphtha engines) in contrast to that from gasoline engines is not usually an important source of air pollution. When in good condition and operated properly it emits less toxic gases (CO and hydrocarbons) than a spark ignition engine. Atmospheric pollution from diesel engines depends to a large extent upon the driver as well as on the mechanical condition of the vehicle. Public education is needed and punitive action against offenders. Switzerland has established norms to prevent vehicular air pollution: rapid acceleration and deceleration must be avoided, overloading is forbidden, the vehicle must be frequently checked and kept in excellent working condition. Black exhaust fumes quickly identify an offending vehicle. Maximum permissible opacity for the exhaust fumes can be established by the use of opacimeters. The ideal opacimeter should be ruggedly made to withstand all road conditions and the 700 deg. C temperatures of the gases emitted, it should be easily installed and easily read on either a stationary vehicle or a moving one. The most frequently used types (Hartridge, UTAC, Bosch) and the advantages and disadvantages of each are discussed. Permissible values (Hartridge) are given for different types of vehicles. A schematic drawing is given of the Bosch opacimeter.

07844

Maga, J. A., H. Wong-Woo, and M. G. Mason

A STATUS REPORT ON MOTOR VEHICLE POLLUTION IN CALIFORNIA. J. Air Pollution Control Assoc., 17(7):435-438, July 1967.

The accomplishments to date indicates problems that exist, and the outlook for control are reviewed by analyzing emissions trends in four urban areas in the state. To illustrate the effect of the current anticipated control efforts in California, six charts are presented showing the emission estimates in four areas from 1940 to 1980. A review of all the factors involved indicates that there is no simple and inexpensive solution to the complex problem of motor vehicle created air pollution. The problem has many aspects. It is legal, political, social, economical, and technological. The final solution must incorporate considerations for all these aspects. The motor vehicle control program in California has reduced emissions of hydrocarbons and carbon monoxide into the atmosphere. In spite of the increasing number of vehicles there has been a reversal in emission trends for the first time. If the goal of prewar air quality is to be achieved, there must be a high degree of emission control. Consequently, the program requires that effective systems be available, and that virtually no cars be exempt. Lack of efficiency control of some emissions, large numbers of cars uncontrolled, and deterioration in efficiency of control systems will lead to air quality poorer than that desired. Under the present program, which is oriented toward the installation of control systems on new cars, the reduction of contaminants emanating from motor vehicles will be gradual. In order to accomplish a rapid improvement, within a few years, exhaust emissions from all cars (new and used) must be controlled.##

07875

T. E. Kreichelt, D. A. Kemnitz, S. T. Cuffe

ATMOSPHERIC EMISSIONS FROM THE MANUFACTURE OF PORTLAND CEMENT.
Public Health Service, Cincinnati, Ohio, National
Center for Air Pollution Control, PHS-Pub-999-AP-17,
47p., 1967. 29 refs.
GPO: 803-789-2

Information is presented on actual and potential atmospheric emissions resulting from the manufacture of cement. Raw materials, process equipment, and production processes are described, as well as the location of plants, and process trends. Emission and related operating data are presented, along with methods normally employed to limit or control emissions from the dry, semi-dry, and wet processes. The main source of emissions in the cement industry is the kiln operation. Dust generated in the dry-process kiln may vary from 1 to 25 percent expressed in terms of finished cement; from the wet process, 1 to 33 percent. Sulfur dioxide emissions from the kiln gases combine with the alkalies as condensed sulfates. In the wet process, an odor problem may arise from heating certain types of raw material such as marine shellls, marl, clay, or shale. Another important source of dust emissions in the cement industry is the dryer normally used in dry process plants. Dust can be adequately arrested in the cement industry by proper plant layout and proper selection of high-efficiency multicyclones, electrostatic precipitators, or fabric filters. Electrostatic precipitators or fiber-glass fabric filters that have been properly designed, installed, operated, and maintained will adequately collect the dust from the hot kiln gases. In many plant designs, multicyclones precede the precipitator or fabric filter. Precipitators or low-temperature fabric filters alone may be adequate on other unit operations such as handling, crushing, grinding, drying, and packaging. Dust emissions as low as 0.03 to 0.05 grains per standard cubic foot have been obtained in newly designed, well controlled plants.##

07925

Beighton, J.

THE SPECIAL INDUSTRIAL PROCESSES. Roy. Soc. Health J. (London). 87(4):215-218, July-Aug. 1967. 2 refs. (London)

The air pollution problems of a group of industries which produce: sulfuric acid, nitric acid, petroleum and petrochemicals, iron and steel, copper, aluminum, gas, ceramics and electric power are reviewed. The basic technical approach is to avoid the formation of the emission by design of the process, then to require the treatment of any unavoidable emission, and finally to require adequate dispersal of any residual amount which has to be discharged. The legislation is designed to compromise between safeguarding of public health and amenities and providing for a realistic acceptance with adequate control of special processes. Although the loss of gases in the manufacture of sulfuric acid is limited to 2% of the sulfur burned, the loss from a contact acid plant with a 500-ton-per-day capacity may be considerable so that chimney heights as high as 450 ft may be required. Acid mist from contact plants burning sulfur is a special problem as it is difficult to control and its occurrence is unpredictable. There are two nitric acid plants in Britain equipped with catalytic tail-gas reduction units which should solve the problem of brown nitrous fume emission to the air. The use of special flares is required to control H2S and mercaptans emitted by oil refineries. In the steel industry the development of the Fuel-Oxygen-Scrap process is regarded as an alternative to the electric arc furnace. It is claimed that melting and refining can be carried out without exceeding a fume level of 0.05 grains per cu ft.##

07945

A. Parker

REDUCTION AND PROBLEMS OF AIR POLLUTION IN GREAT BRITAIN 1938 TO 1976. Roy Soc. Health J. (London), 87(4):204-209, July-Aug. 1967.

Air pollution from the use of fuels is discussed. 1938 was chosen as the beginning date because the 1939-1945 war caused a coal shortage. The smog of 1952, which killed 4,000 people in Greater London, stirred public opinion. The Clean Air Act of 1956 which resulted produced a marked reduction in smoke emission and an improvement in the fuel use efficiency. In spite of the decrease in the use of coal by railways, collieries, industrial processes, and domestic heating, there has been an overall increase since 1938. This increase is largely due to increased consumption by electrical powerplants. The total smoke production is down, but SO2 produced by power-generating plants has increased five-fold since 1938 resulting in an increased SO2 total in spite of reductions in other areas. There is no section

in the Clean Air Act of 1956 for SO2 control except one for chimney heights. The chief British complaint about transportation is the unnecessary black smoke from diesels. It is estimated that by 1976 the amount of smoke emitted will be reduced; SO2 will not be any greater; and 'co and hydrocarbons from exhaust gases will be the same for the country as a whole. In the cities, the situation is such that the traffic could hardly be any worse, so that with main roads bypassing the center of towns, and more efficient engines, there may be an improvement on the busiest streets.##

08099

Frey, J. W. and M. Corn

PHYSICAL AND CHEMICAL CHARACTERISTICS OF PARTICULATES IN A DIESEL EXHAUST. Am. Ind. Hyg. Assoc. J., 28(5):468-478, Sept. Oct. 1968. 27 refs. (Presented at the Aerosol Technology Session, American Industrial Hygiene Association Annual Meeting, Chicago, Ill., May 4, 1967.)

The particulate phase of emissions from a single cylinder, four cycle diesel engine was sampled four inches from the exhaust valve by a variety of methods, including oscillating thermal precipitator and membrane filter. The engine was operated and studied at three conditions: idle speed, no load, moderate temperature; intermediate speed, no load, high temperature; and half load, resultant speed and temperature. The particulates were studied to determine their particle size distribution, specific surface, chemical composition, and acidity. Results are expressed in terms of emission per cubic centimeter of fuel and per cubic meter of exhaust. Representative results are particles in the size range 10 to 500 microns projected are diameter and emission concentrations of 50 mg/cu m, 10 to the 7th power particles/cc, and 2 square meters of particle surface area per cubic meter of exhaust. Experimental methods and results are discussed in detail. (Authors' abstract)##

08165

Nedogibchenko, M. K.

PRESENT DAY CONDITIONS OF ATMOSPHERIC AIR POLLUTION BY AUTOMOBILE EXHAUST GASES IN CITIES AND PROBLEMS OF ITS CONTROL. In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 195-199, May 1960.
CFSTI: TT 60-21475

Air quality measurements in Russian cities indicated that carbon monoxide was the most important automotive exhaust pollutant. In Moscow, maximum concentrations of carbon monoxide reached 100 - 200 mg/cu m; in Leningrad 145 to 164 mg/cu m; in Saratov 20 to 60 mg/cu m; In Perm 40 to 60 mg/cu m, and in Ivanova 18 to 88 mg/cu m. In Sverdlovsk the lead content in the exhaust gases ranged between 0.069 to 3.70 mg/cu m, depending upon the made of the motor vehicle. Investigations in Moscow in connection with the utilization of ethylated gasoline by the passenger auto transport revealed only from 0.001 to 0.003 mg/cu m of lead in the street air. Investigations disclosed in auto transport exhaust gases the presence of a polycyclic hydrocarbon, 3, 4-benzpyrene, generated at the rate of 0.75 mg/min. According to most recent reports auto transport exhaust gases were polluting atmospheric air also with nitrogen oxides; the more incomplete was the gas combustion the greater was the quantity of formed carbon monoxide and less of nitrogen oxides were emitted into the air; vice versa, the more complete the gas combustion the less CO was formed and the more nitrogen oxides were discharged into the air. Next in importance to air pollution with carbon monoxide is air pollution with soot discharged in large quantities with automobile exhaust gases. The cause of this type of atmospheric air pollution lies in the unsatisfactory technical construction and mechanical and functional adjustment of the engines. The reduction of city air pollution caused by auto-transport exhaust gases should be carried out along the following basic lines: Improvement in the design of automobile motors and carburetors with a view to increasing degree of combustion and of gasoline utilization. Development of methods to render harmless exhaust gases emitted by auto-transport engines, preferably by oxidizing them to smaller non-harmful or less harmful molecules.##

08376

Fiero, George W.

SOLVENTS, SMOG AND RULE 66. J. Am. Soc. Lubrication Engr., 23(11):448-458, Nov. 1967. 29 refs. (Presented at the 22nd ASLE Annual Meeting, Toronto, Canada, May 1-4, 1967.)

Solvents and cleaners evaporate into the air and some of them may become pollutants. Their quantity, however, is relatively small and their photochemical reactivity is relatively low. Since, however, certain solvents when tested in smog chambers at relatively hihg concentration (4ppm) do produce eye irritating products, their use is restricted in Los Angeles by Rule 66 and in the San Francisco Bay area by Regulation 3. These are discussed in detail. The topographical and meteorological characteristics of these locations are unique. Therefore, such restrictions should not be imposed in other localities until a thorough study is made to determine the extent, if any, which solvents may contribute to smog.

08377

Parker, Charles H.

PLASTICS AND AIR POLLUTION. Soc. Plastics Engr. J., 23(12):26-30, Dec. 1967. 24 refs.

General information is given on the air pollution cycle and common types of air pollutants and their sources. Photochemical pollutants are of most interest in synthetic resin and polymer technology. A recent survey showed that in the Los Angeles District, 550 tons per day of organic materials were emitted from organic solvent usage as of Jan. 1965. Plastics, rubber, adhesives, and putty contributed 45 tons per day. In their respective forms of plastic, coating binder, or related products, synthetic resins or polymers are created from building blocks stemming from fundamental products such as petroleum, natural gas, coal, fixed nitrogen, oxides of carbon, and others. At each stage of conversion, from the fundamental products to a resinous consumer product and its disposal, there are air pollution problems to solve which involve research expenditure. Information is also given on factors to consider when evaluating the presence of a potential air pollution hazard resulting from the manufacture or use of synthetic resins, polymers, or elastomers. The main points are given of Senator Muskie|s bill (S.780) on air pollution. It is poined out that most states have some form of air pollution legislation either pending or in effect. Factors are given which must be considered when estimating the costs oa applying air pollution ontrol techniques. These include the recovery of useful materials and tax benefits.

08497

Hoffman, Heinz

EXHAUST GAS PROBLEMS WITH GASOLINE AND DIESEL ENGINES. II. DIESEL ENGINES. ((Abgasprobleme bei Otto- und Dieselmotoren. II. Dieselmotoren.)) Text in German. Erdoel Kohle (Hamburg), 20(9):644-648, Sept. 1967.

The various pollutants present in the smoke produced by diesel engines were measured and discussed. The results, illustrated in tables and graphs, show that CO emission is only 1/10 that allowed for gasoline engines and is therefore of minor importance. Aldehydes with their characteristic irritating odor are also produced in small quantities and are considered annoying, but medically unimportant. The nitrogen oxides, NO and NO2, are produced in sufficiently large quantities to cause lack of oxygen in the blood, and inflammation of the respiratory tract. The antechamber motor produces fewer nitrogen oxides than the direct injection motor. Amount of SO2 produced is negligible. 3,4-Benzopyrene is emitted in significant quantities when an engine emits a large quantity of smoke and then only if the motor is run under high pressure. As a control measure a reduction in smoke quantity is recommended. The smoke characteristics can also be greatly influenced by the design of the combustion chamber and proper maintenance of the engines.##

08633

Cleary, Graham J.

AIR POLLUTION AND THE AUTOMOBILE. Clean Air (J. Clean Air Soc. Australia New Zealand) 1(1):7-9,11, June 1967. 18 refs.

The magnitude and nature of the emissions from automobile engines are examined. Most of the pollution is discharged through the tail pipe (about 60 percent on a total hydrocarbon basis), but crankcase emissions (30 percent) are also appreciable. The remaining ten per cent is made up of evaporation losses from the fuel tank and from the carburettor after the engine has stopped. Eye irritation, plant damage and cracking of typre rubber have been found in communities heavily polluted by automobile exhaust products. Control measures to minimize pollution are considered. These involve burning the exhaust gases from the tail pipe by means of either thermal or catalytic afterburners, and recycling the vent gases from the crankcase to either the air manifold or the carburettor. Statistics about the current car population in Sydney and the anticipated future growth rate are presented, and an estimate is made of the future date (1998) when the volume of exhaust products in Sydney will be the same as that in Los Angeles in 1942, when conditions of smog were first experienced. (Author#s abstract)

08802

Hoffmann, H.

THE COMPOSITION OF EXHAUST GASES FROM DIESEL MOTORS. ((Die Zusammensetzung der Auspuffgase bei Dieselmotoren.)) Text in German. Z. Praeventivmed. Vol. 11, p. 104-121, March-April 1966.

The smoke emission of different types of diesel motors was determined and the results presented in a series of graphs. Under full load little difference in smoke emission was observed between chambered engines and direct injection engines, while the latter were superior under partial load. The various factors in engine development which influence smoke emissions are discussed. The carbon monoxide, aldehyde, and nitrogen oxide content of the exhaust gas was determined and it was found that the CO content is of no concern in diesel motors, since the concentration is not over 0.1-0.15 Vol.% and in many cases below 0.05 Vol.%. The same is true for aldehydes whose odorous annoyance has a psychological but not medical effect at the emitted concentrations. The nitrogen oxide content was found to be higher with direct fuel injection engines. The amount of 3,4-benzopyrene emission is influenced by the fuel composition and the combustion system and is only of concern if the motor is operated under high mean pressure, when as much as 0.5 gamma benzopyrene in 500 liters of exhaust gas was found at 1200-1500 U/min. under 3/4 load. It is concluded that by proper construction and development and particularly by proper care of the engine, the smoke from modern diesel engines can be reduced to an unobjectionable amount.##

09023

Epstein, George and Edward F. Westlake, Jr.

MATERIALS FOR SPACE CABINS: THE FIRE HAZARD AND ATMOSPHERE CONTAMINANT CONTROL PROBLEMS. Aerospace Corp., El Segundo, Calif., Materials Science Lab., Contract F04695-67-C-0158, TR-0158(3250-20)-8, SAMSO-TR-67-76, 27 p., Oct. 1967. 3 refs.
CFSTI: AD 663418

The flammability and atmospheric contaminant hazards associated with the use of plastics and other nonmetallic materials in manned spacecraft cabins are discussed. Outgassing characteristics and mechanisms of typical materials are described. Flammability and combustion rates are discussed as highly important materials selection factors. An approach is presented for minimizing the hazards through judicious selection and batch control of cabin materials. (Authors' abstract, modified)##

09026

Burckle, J. O., J. A. Dorsey, and B. T. Riley

THE EFFECTS OF THE OPERATING VARIABLES AND REFUSE TYPES ON THE EMISSIONS FROM A PILOT SCALE TRENCH INCINERATOR. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((28))p., 1968. 19 refs. (Presented at the National Incinerator Conference, New York, N. Y., May 5-8, 1968.)

This work defines the air pollutant emissions from a Trench Incinerator burning three types of refuse material: low ash, moderately high heat content materials characterized by cord wood; high ash, high heat content material characterized by rubber tires; high ash, low heat content material characterized by municipal refuse. Use of a trench incinerator for the disposal of the high ash content materials studied generated particulate emissions which, in all cases, exceeded 1 grain per standard cubic foot at 12 per cent carbon dioxide and is therefore not recommended. For disposal of low ash, high heat content materials, the data indicate that, except for nitrogen oxides, emission levels from the trench incinerator may be acceptable if rigid operating controls are predetermined for the specific refuse material. (Author's abstract)##

09175

M. W. First, P. Zilles, J. Walkley

DISPOSAL OF LOW LEVEL RADIOACTIVE WASTE IN COMMERCIAL INCINERATORS. In: Proc. Ninth AEC Air Cleaning Conference, Boston, Mass., Sept. 13-16, 1966. James M Morgan, Jr. and Melvin W. First (eds.), Washington, D. C., Atomic Energy Commission, Vol. 1, Jan. 1967, p. 570-585. 7 refs.
CFSTI: CONF 660904

A comparison was made of the performance of a crematory-type incinerator and a combination steam-boiler incinerator in the combustion of difficult laboratory and hospital wastes such as animals and cage litter. Because of excessive stack emissions of smoke, fly ash, and malodorous gases and vapors, the crematory-type proved unsatisfactory. Under the most favorable operating conditions for avoidance of air pollution and for production of a good quality residue, burning capacity was only 2 to 3 lbs/sq ft/hr. Higher burning rates produced severe nuisances. The mechanized steam-boiler incinerator, on the other hand, provided a sanitary method for handling and burning such wastes in an efficient and rapid manner. A cyclone dust collector proved superfluous for use with gas or oil fuels and it was found that it could be eliminated without decreasing the overall collection efficiency of an electrostatic precipitator which served as a final cleaning stage. (Au

09216
Hess, W.

SURVEY OF AIR ANALYSES IN THE CITY OF ZURICH IN 1961-9165.

((Ubersicht uber die Luftuntersuchungen in der Stadt Zurich von 1961 vis 1965.)) Text in German. Z. Praeventivmed., 11(2):144-156, March -April, 1966. 5 refs.

Extensive measurements of CO and NO2 levels were made during 1961 - 1965 at several intersections and a tunnel in Zurich. COHb levels in the blood of traffic policemen were also measured and plotted against time; wind velocity and the number of vehicles passing the measuring points were noted. A check of diesel trucks showed that 15-20 percent had an excessive soot content in the exhaust gases. The SO2 level was strongly dependent on atmospheric humidity.

09315

Newhall, H. K. and E. S. Starkman

DIRECT SPECTROSCOPIC DETERMINATION OF NITRIC OXIDE IN RECIPROCATING ENGINE CYLINDERS. Preprint, Society of Automotive Engineers, 18p., 1967. 35 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 9-13, 1967, Paper 670122).

A theoretical and experimental investigation was carried out to determine the mechanism whereby nitric oxide is formed, conserved, and exhausted from the reciprocating engine combustion chamber. The equipment utilized a magnesium oxide window to transmit the infrared radiation from the combustion chamber; a monochrometer to disperse the radiation, and a cryogenically cooled semiconductor to sense and indicate the nitric oxide produced radiation. The results confirmed the theoretical prediction based on chemical kinetics that nitric oxide, once formed in approximately equilibrium quantities in the combustion process will thereafter not disappear because the engine expansion takes place more rapidly than the kinetic processes can accommodate. The theory and measurements allow more rational explanations for the well documented influences which mixture strength, spark timing, compression ratio, and engine speed exert on oxides of nitrogen concentration in engine exhaust. (Authors abstract)

09323

T. A. Huls, H. A. Nickol

INFLUENCE OF ENGINE VARIABLES ON EXHAUST OXIDES OF NITROGEN CONCENTRATIONS FROM A MULTI-CYLINDER ENGINE. Preprint, Society of Automotive Engineers, 12., 1967. 12 refs. (Presented at the Mid-Year Meeting of the Society of Automotive Engineers, Chicago, Ill., May 15-19, 1967. Paper 670482.)

The influence of engine variables on the concentration of oxides of nitrogen present in the exhaust of a multicylinder engine was studied. The concentrations of nitric oxide (NO) were measured with either a mass spectrometer or a non-dispersive infrared analyzer. The CO concentration was low for rich operation (deficient in oxygen) and increased with air-fuel ratio to a peak value at ratios slightly leaner than stoichiometric proportions. A further increase in air-fuel ratio resulted in reduced NO concentrations.

Advanced spark timing, decreased manifold vacuum, increased coolant temperature and combustion chamber deposit buildup were also found to increase exhaust NO concentration. These results support either directly or indirectly the hypothesis that exhaust NO concentration is primarily a result of the peak combustion gas temperature and the available oxygen. The NO concentration of the exhaust from an individual cylinder is a function of the air-fuel ratio of the charge that the individual cylinder receives. Since the NO concentration as a function of air-fuel ratio is highly non-linear, it was concluded that the NO concentration of the conglomerate exhaust is a function of distribution as well as overall air-fuel ratio. The NO concentration of the gases expelled from an engine cylinder varies with time. The last portion to be expelled is, at least under some operating conditions, lower in NO concentration than the average of the well mixed exhaust gas from that cylinder. These results can be explained by flame quenching resulting from the relatively cold combustion chamber walls. (Authors' Abstract)##

09341

Oberdorfer, P. E.

THE DETERMINATION OF ALDEHYDES IN AUTOMOBILE EXHAUST GAS. Preprint, Society of Automotive Engineers, 10p., 1967. 14 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 9-13, 1967, Paper 670123.)

A method for the sampling and determination of exhaust aldehydes and ketones is described. The procedure consists of absorbing and converting these compounds to the solid 2,4 di-nitrophenylhydrazone derivatives. Results are reported as total aldehydes and/or the derivatives separated into individual, identifiable components by chromatographic techniques. Exhaust emission data employing this procedure are presented for a limited number of vehicles with and without exhaust control systems. Total aldehyde levels (as formaldehyde) were found to range from about 20 to over several hundred parts per million depending on the mode of operation and the adjustment of such variables as air-fuel ratio, spark timing, and exhaust emission control devices. Effects of these variables on aldehyde emissions are discussed. The relationship of the chemical structure of inducted fuel to aldehyde emissions is also touched upon. The amount of individual aldehydes was found to be related to the parent fuel to a considerable extent for pure individual hydrocarbon fuels. This relationship is greatly diminished, however, within the design limitations of current full boiling practical gasolines. (Author's abstract)##

09355

Pahnke, Alden J. and Edward C. Squire

LEAD IN GASOLINE: NO EFFECT ON EXHAUST EMISSIONS FOUND IN 18-MONTH CONSUMER-CAR TEST. Oil Gas J., 64(50):106-110, Dec. 12, 1966.

Use of tetraethyl lead in gasoline does not significantly affect exhaust emission characteristics of vehicles driven by the motoring public. This is the conclusion reached after a test of leaded and unleaded gasoline in 122 privately owned and operated cars spanning a period of 18 months and covering a total of 2,500,000 miles. Carbon monoxide and hydrocarbon-emission levels of the cars operated on leaded gasoline were essentially equivalent to those of the cars driven on unleaded gasoline. Photochemical reactivity and nitrogen oxide levels for the two car groups were also equivalent, further demonstrating the absence of any effects of tetraethyl lead on vehicle emissions either positive or negative.##

09393

Hettche, O.

AIR POLLUTION IN LOCALITIES WITH HEAVY TRAFFIC IN METROPOLITAN CITIES. ((Die Verunreinigung der Atmosphare an verkehrsreichen Punkten in Grossstadten.)) Text in German. Z. Praeventivmed. 11(2):122-133, March-April 1966. 27 refs.

Data on the variations in time of CO, SO2, NO, NO2, hydrocarbons, polycyclic hydrocarbons, lead compounds and dust in various European cities such as Stuttgarg, Frankfurt, Hamburg, Essen and London are discussed and compared with data from Los Angeles. In heavy traffic, concentrations of up to 20 mg. CO, 0.2 mg. NO, 0.1 mg. NO2, 0.05-0.4 mg SO2, 2-10 mg. hydrocarbons and 4 microgram of lead per cubic meter were found. Polycyclic hydrocarbons such as benzpyrene and coronene can be determined accurately only in tunnels by analysis of the intake air and the air in the tunnel. In Germany, more diesel engines are in operation than the 0.3 percent in Los Angeles. Diesels generate only about 1 percent CO but maintenance must be frequent and soot emission must be controlled. Two-cycle engines give a very low CO emission. Methods used in Germany for the determination of pollutants are outlined. Standardization of analytical methods is emphasized.

09715

Eyzat, Pierre and Jean-Claude Guibet

THEORETICAL AND EXPERIMENTAL STUDY OF THE FORMATION OF NITROGEN OXIDES IN INTERNAL COMBUSTION ENGINES. ((Etude theorique et experimentale de la formation des oxydes d'azote dans les moteurs a combustion interne.)) Text in French. Ingrs. Automobile (Paris, 41(2):91-102, Feb. 1968. 11 refs.

A mathematical mode of estimation is explained which allows one to determine in advance the levels of NO in automotive exhaust. An excellent correlation has been observed between the calculated and measured values. The levels of NO in the exhaust result from the creation of an equilibrium of the bimolecular system N2 and O2, which is principally controlled by temperature and the amount of free O2 present in the burning gas. This simulation program allows one to select, from a theoretical viewpoint, the optimal components of combustion with respect to the agreed production of NO. One can thus mathematically fix the products of slow and fast combustions.

09737

Ozolins, G. and C. Behmann

AIR POLLUTANT EMISSION INVENTORY OF NORTHWEST INDIANA. (A PRELIMINARY SURVEY, 1966.) Public Health Service, Durham, N. C., National Center for Air Pollution Control, APTD-68-4, 36p., April 1968.

Sources of air pollutant emissions were surveyed to quantify the total pollution load emitted to the air over the Northwest Indiana communities of East Chicago, Gary, Hammond, and Whiting. The emissions are reported on an annual basis and subdivided into the five major pollutants: particulates, sulfur oxides, nitrogen oxides, hydrocarbons, and carbon monoxide. The four major source catagories that were utilized in reporting emissions from area and point sources are: fuel combustion in stationary sources, fuel combustion in mobile sources, combustion of refuse, and industrial process losses. The results of this survey are reported by city and illustrated on the grid system established by the Northwest Indiana Air Resource Management Program. (Authors' abstract)

09752

Beaver, Hugh

COMMITTEE ON AIR POLLUTION: REPORT. London, Her Majesty's Stationery Office, 1960, 80p. (Presented to Parliament by the Minister of Housing and Local Government, the Secretary of State for Scotland and the Minister of Fuel and Power by Command of Her Majesty, Nov. 1954.)

A committee on air pollution was established to examine the nature, causes, and effects of air pollution and the efficacy of present preventive measures; to consider what further preventive measures were practicable; and to make recommendations. The report of the committee examined current emission sources of pollutants, the effects of air pollution on health, and the legislation and administration of air pollution. Some recommendations made by the committee were: prohibition of emission of dark smoke from chimneys; arresting plant for grit and dust obligatory in new industrial installations; control of smoke from railways; establishment of smokeless zones and smoke control areas; provisions of financial assistance by Local Authorities; requirement of Local Authorities to submit annual reports on progress of smoke abatement; preparation of documents on codes of practice and standards; clean air should be national policy; establishment of a "Clean Air Council" to coordinate and encourage research work.

09759

Sharpe, L. M.

ENERGY SOURCES AND POLICIES, THEIR IMPACT ON AIR POLLUTION, CURRENT AND PROJECTED. Public Health Service, Washington, D. C., Bureau of Disease Prevention and Environmental Control, Contract PH-86-67-69, ((227))p., April 15, 1967. ((76)) refs.

There have been a number of energy studies over the last 15 - 20 years that have attempted to project the national energy needs to various dates in the future. This study compiles energy projections and the "mix" of energy sources to the year 2000, made as recently as 1967, and, on the basis of these data: estimates the atmospheric pollution burden to be expected by the years 1980 and 2000 provided present fuel policies remain essentially unchanged; summarizes some of the major technological developments that could have an impact on energy source selection and total energy requirements; identifies and discusses some of the major government policies that affect both fuel source and energy demand; outlines some approaches to an evaluation on a benefit/cost basis of alternative policies that would reduce atmospheric pollution and completes the analysis for the solvent refined coal process.

09781

Environmental Science Services Corp., Stamford, Conn.

SOLVENT EMISSION CONTROL LAWS AND THE COATINGS AND SOLVENTS INDUSTRY. (A TECHNO/ECONOMIC STUDY.) 56 p., ((1967)). 6 refs.

The widespread adoption of the strict California solvent emission laws will seriously effect practices and products in the surface coating industry. The California codes contain three main elements: the emission of photochemically reactive solvents is restricted; the sale of coatings containing these materials is banned; and the emission of these materials during the manufacture of coating materials is restricted. Widespread adoption of these codes would cause changes in the formulation of the coatings, and would adversely affect the markets for mineral spirits, napthas, substituted aromatics, branched ketones, olefins, and trichloroethylene. However, alcohols, esters, odorless mineral spirits, and glycolesters would gain markets at the expense of the photochemically active solvents. Emission control methods, analytical techniques, and measurement methods are outlined. The effectiveness of various organic solvents in photochemical smog formation is discussed. An evaluation of existing regulations, with emphasis on California Rule 66, is presented along with lists of exempt sources.

09784

Danielson, John A. (comp. and ed.)

AIR POLLUTION ENGINEERING MANUAL. (AIR POLLUTION CONTROL DISTRICT, COUNTY OF LOS ANGELES.) Public Health Service, Cincinnati, National Center for Air Pollution Control, PHS-Pub-999-AP-40, 999-AP-40, 892p., 1967. ((314)) refs.
GPO: 806-614-30

The control of air pollution at individual sources peculiar to the Los Angeles area is considered. The practical engineering problems of design and operation for many sources of air pollution are emphasized. There are 11 chapters, each by different authors, and 4 appendixes. The chapter titles are: (1) Introduction; (2) Contaminants; (3) Design of Local Exhaust Systems; (4) Air Pollution Control Equipment for Particulate Matter; (5) Control Equipment for Gases and Vapors; (6) Metallurgical Equipment; (7)

Control Equipment; (8) Incineration; (9) Combustion Equipment; (10) Petroleum Equipment; and (11) Chemical Processing Equipment. The introduction discusses the Los Angeles Basin, rules and regulations in Los Angeles County, and the use of the manual. The appendixes' titles are: (A) Rules and Regulations; (B) Odor-Testing Techniques; (C) Hypothetical Available Heats from Natural Gas; and (D) Miscellaneous Data.

09785

Dickinson, Janet, Robert L. Chass, and W. J. Hamming

AIR CONTAMINANTS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 11-21, 1967.
GPO: 806-614-30

The parameters of an air pollution problem, particularly the problem in Los Angeles County; the measures taken to eliminate the problem; and control measures still needed are described. The air contaminants include: organic gases (hydrocarbons, hydrocarbon derivatives); inorganic gases (NOx, SOx, CO); miscellaneous inorganic gases (NH3, H2S, Cl2, F2); particulates (carbon or soot particles, metallic oxides and salts, oily or tarry droplets, acid droplets, metallic fumes). Each is discussed indicating the sources and significance in the air pollution problem.

09827

Talens, Paul G.

PATHOLOGICAL-WASTE INCINERATORS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 460-471, 1967.
GPO: 806-614-30

Multiple-chamber incinerator design considerations for burning pathological-waste are discussed. Crematory furnaces are also discussed since they have design standards similar to those of pathological-waste incinerators. The cremation of human remains differs from other pathological incineration only in that the body is usually contained in a wooden casket. The casket must be considered when designing these units. Pathological-waste incinerators can produce emissions of fly ash, smoke, gases, and odors that would be highly objectionable. The prevention of air contaminant emissions by good equipment design is the best air pollution control procedure to follow. As with other incinerator design calculations, those for pathological-waste incinerators also fall into three general categories: (1) Combustion calculations, (2) flow calculations and (3) dimensional calculation. The factors to be used in these calculations for pathological incinerator design are listed. Typical calculations involved in the design of an incinerator to dispose of 100 pounds of dog bodies per hour are illustrated.

09830

Netzley, Arthur B.

WIRE RECLAMATION. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 495-503, 1967.
GPO: 806-614-30

Scrap copper wire, with a diameter in the range 14 gage to one inch, which has combustible insulation is reclaimed by burning off the insulation in an incinerator. A great variety of materials composes the combustible insulation: Rubber, paper, cotton, silk, and plastics such as polyethylene and polyvinyl chloride. Moreover, the wire itself may have a baked-on coating of plastics, paint, or varnish. As received for burning, the total combustible content of the insulated wire may vary widely from several percent to over 50 percent by weight. Most commercial wire contains from 20 to 35 percent insulation. Burning in the open is accompanied by copious quantities of dense smoke, disagreeable odors, inorganic materials, and oxygenated hydrocarbons. Burning in single-chamber incinerators produces somewhat less smoke, odors, and other air contaminants than open burning does, since combustion air can be regulated. The only practical industrial equipment available today for controlling emissions from single-chamber insulation-burning incinerators is an afterburner or secondary combustion chamber. The composition of stack gases from equipment with and without afterburners is presented. Design methods, materials of construction, and operating procedures are discussed and illustrated.

09835

Walters, Donald F.

WASTE-GAS DISPOSAL SYSTEMS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 565-606, 1967.
GPO: 806-614-30

Petroleum refineries must dispose of large quantities of hydrocarbon vent, waste, blowdown, and emergency pressure release gases. Types, design, instrumentation, and operating practices for gas disposal flares are presented. These include elevated and ground level flares, burner design, steam injection, ignition and pilot light systems, flare sizes and capacities, removal of entrained mists, and provision for emergency overloads. Pressure relief systems are also thoroughly discussed. Commonly used terms dealing with relief systems are defined. Design methods and operating procedures for safety valves (standard and balanced), rupture discs, vent lines, vent headers, and vent gas scrubbers are discussed and illustrated.

09838

Cuffe, Stanley T.

CATALYST REGENERATION. In: Air Pollution
Engineering Manual. (Air Pollution Control District, County of Los
Angeles.) John A. Danielson (comp. and ed.), Public Health Service,
Cincinnati, Ohio, National Center for Air Pollution Control,
PHS-Pub-999-AP-40, p. 642-652, 1967.
GPO: 806-614-30

The regeneration of catalysts employed in petroleum refining processes, such as fluid and Thermofor catalytic cracking, is accomplished by burning coke and sulfur deposits from the catalyst surface. Combustion gases from regeneration include the pollutants CO, SOx, NOx, NH3, hydrocarbons, and particulate matter. Tables of data collected in 1956 are presented which specify process flow rates, catalyst circulation rates, regenerator air rates, coke burn-off rates, flue gas temperatures, particulate losses, hydrocarbon emission and analysis, and stack gas composition and volumes. Pollution control methods presented and discussed are: wet and dry cyclones, carbon monoxide waste heat boilers, and electrical precipitators. The economy of a CO boiler depends on the catalyst regenerator flue gas volume, temperature, fuel value, and CO2/CO ratio. An analysis of flue gases from CO waste heat boilers is presented for cases where ammonia has and has not been injected into the gas stream before the electrostatic precipitator.

10015

Johnson, Kenneth L., L. H. Dworetzky, and Austin N. Heller

CARBON MONOXIDE AND AIR POLLUTION FROM AUTOMOBILE EMISSIONS NEW
YORK CITY. Science, 160(3823):67-68, April 5, 1968.

Equipment to monitor continually carbon monoxide concentrations was installed near street level at five locations in Manhattan. The largest amount of valid data was obtained at 110 East 45 Street from 6 January through 17 May 1967, and from 30 July through 14 September The sampling probe was set approximately 15 feet above the pavement and 5 feet into the street from the curb. A continuous flow of air was analyzed and recorded 24 hours per day, 7 days per week. The average hourly concentrations exceeded 15 parts per million from 9:0 a.m. to 7:00 p.m. Simultaneous hourly traffic counts and hourly average concentrations of carbon monoxide for 4 April 1967 are shown It is shown that local business-day traffic determines the diurnal carbon monoxide concentrations at individual sites in Manhattan. Concentrations during the day can be predicted from readings taken i early morning.

10475

Sage, B. H.

PARTIAL OXIDATION PRODUCTS FORMED DURING COMBUSTION. (SUMMARY
REPORT.) California Inst. of Tech., Pasadena, Chemical
Engineering Lab., 26 p., 1968. 3 refs.

A research program dealing with the influence of oscillatory combustion of various fuels on the residual quantities of nitrogen oxides and other partial oxidation products is summarized. Experiments were conducted at a pressure of 50 lb./sq. in. employing air and a range of fuels including natural gas, ethane, propane, and butane. The highest NOx levels occurred at near stoichiometric mixture levels, with a sharp decrease at richer mixtures, and a more gradual decrease at leaner mixtures. The budget of the program, along with a list of publications and reports and personnel requirements, is presented.

10660

Laffey, William T. and Robert N. Manning

SOLVENT SELECTION FOR THE REDUCTION OF AIR POLLUTION. Hercules Chem., No. 56:1-6, March 1968. 5 refs.

Regulations restricting the use of solvents which partake in photochemical smog reactions have caused the solvent and surface coating industries to develop alternate solvent formulations. A system is presented whereby a restricted solvent can be simulated using combinations of allowable materials. The procedure is graphical and depends on the solvent parameters and solubility characteristics of the materials. When several formulations are found which possess the required solvent properties, the choice of the best one then depends on economic or other factors.##

10748

Fenimore, C. P., and G. W. Jones

COMPARATIVE YIELDS OF SOOT FROM PREMIXED HYDROCARBON FLAMES. Combust. and Flame, 12(3):196-200, June 1968.

Ethylene and acetylene gave eight times more soot when burnt with oxygen. The comparison was made in flames having the same temperature, and about the same pack concentrations of species from which the soot is supposed to grow (hydrocarbon radicals, acetylene and polyacetylene). We suggest that more effective oxidation of the soot aggregates, particularly during their early stages of growth occurred in oxygen flames, and this decreased the yield. Hydrogen chloride added to acetylene-oxygen flames increased the yield of soot without increasing the concentrations of polyacetylenes. Here too, the yield may have been altered mainly by changes in the oxidation of the early soot aggregates. (Authors' abstract)##

11229

W. S. Landers

TRENDS IN STEAM STATION DESIGN AFFECTING AIR POLLUTION. Preprint, American Society of Mechanical Engineers, New York 4p., 1966. 8 refs. (Presented at the IEEE-ASME Joint Power Generation Conference, Denver, Colo., Sept. 18-21, 1966, Paper 66-PWR-1.)

The design, location, and operation of coal-burning thermal electric plants encompass various elements affecting air pollution, such as plant size and location, stack height, coal used, ash collecting and handling systems. Trends have developed in some of these elements as a result of the various factors governing management decisions on expansion of generating capacity. This paper identifies these trends by an analysis of 150 coal-burning thermal power units scheduled for initial operation from 1958 through 1968. (Author's abstract)##

11231

J. H. Wasser, G. B. Martin, and R. P. Hangebrauck

EFFECTS OF COMBUSTION GAS RESIDENCE TIME ON AIR POLLUTANT EMISSIONS FROM AN OIL-FIRED TEST FURNACE. Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, ((20)) p., 1968. 5 refs. (Presented at the National Oil Fuel Institute Workshop, Linden, N. J., Sept. 17-18, 1968.)

The effects of increased combustion gas residence time on air pollution emissions from an experimental oil furnace are described and compared with earlier data to illustrate the resultant reduction of carbonaceous emissions. Particulate matter, smoke, carbon monoxide, and gaseous hydrocarbon emissions were reduced, and satisfactory operation obtained at lower excess air levels. Sulfur oxides emissions were essentially unchanged. Nitrogen oxides emissions increased by a small amount. Oxygen and carbon dioxide concentrations in the flue gas were closer to theoretical values, indicating a significant improvement in combustion efficiency. Revised combustion chamber design criteria balanced with improved burner design should provide low air pollutant emissions and optimum operating efficiency for fuel-oil-fired domestic furnaces. (Authors' abstract, modified)##

11254

Springer, K. J., G. L. Williams, R. W. Olsen, and Kenneth D. Mills

EMISSIONS FROM GASOLINE-POWERED TRUCKS ABOVE 10,000-LB GVW USING PHS PROPORTIONAL SAMPLING TECHNIQUES. Preprint, American Institute of Chemical Engineers, New York, N. Y., 13p., 1968. 8 refs. (Presented at the 61st Annual Meeting, Symposium on Research and Development in Automotive Air Pollution Control, Los Angeles, Calif., Dec. 1-5, 1968, Paper 53C.)

Exhaust emissions, including hydrocarbons, CO, CO2, and NOx, from three gasoline-powered trucks above 10,000-lb gross vehicle weight are presented. Proportional techniques were used to obtain exhaust samples, permitting emissions to be analyzed and reported on a mass basis. A discussion of the preparations and dynamometer test procedures is included. (Authors' abstract)##

11262

Williamson, Gerald V. and John F. McLaughlin

AIR POLLUTION, ITS RELATION TO THE EXPANDING POWER INDUSTRY.
Union Electric Co., St. Louis, Mo., 16p., 1966. 6 refs.
(Presented at the World Power Conference, Tokyo Sectional
Meeting, Tokyo, Oct. 16-20, 1966, Paper 89.)

Air pollution considerations will be a major factor in the expanding power industry. Micro-meteorological evidence indicates that new plants of 500 to 5,000 MW must be located and designed with a full understanding of the area's urban air standards, up to a distance of 25 miles from the site. With the development of high efficiency dust collectors, stress in the future will be on SO2 and other invisible gases. The balance of the paper amounts to a check-list of what the planner-designers might do, including choice of features of stack height, position of the stack in the heat cycle, and possible provisions during pollution emergencies. (Authors' summary, modified)##

11263

Reamer, H. H., Joan Jacobs, and B. H. Sage

OSCILLATORY COMBUSTION AT ELEVATED PRESSURE. EFFECT OF FUEL.
Preprint, California Inst. of Tech., Pasadena, Chemical
Engineering Lab., ((29))p., ((1966)) 10 refs.

The effect of varying the fuel from natural gas to ethane, propane and n-butane upon oscillatory combustion in a cylindrical chamber 1 in. i.d. and approximately 24 in. in length was investigated experimentally. A significant effect upon the residual quantities of nitrogen and upon the double amplitude of the perturbation in normal stress was noted. Little, if any, effect upon the frequency of the longitudinal perturbations was experienced. The results are presented in tabular and graphical form. (Authors' abstract)##

11457T

Brunner, M., H. Hoffmann, O. Hettche, L. Truffert, W.
Hess, T. Muller, D. Hogger, M. Brunner, J. Richter,
and R. Frick

AIR POLLUTION BY MOTOR VEHICLE EXHAUST GASES. ((Die
Verunreinigung der Atmosphare durch die Abgase der
Motorfahrzeuge.)) Translated from German. Alimenta
(Kilchberg), 4(6):213-220, 1965. (Summaries of papers
presented at a symposium held by the Swiss Commission for Air
Sanitation, Zurich, Sept. 22-23, 1965).

A review of several lectures presented at the Federal Commission for Air Hygiene in Zurich, Switzerland on pollution of the atmosphere by motor vehicle exhaust gases is presented. The following lectures are included in the form of brief communications: 1. The composition of exhaust gases produced by gasoline-burning engines; 2. The composition of exhaust gases of diesel engines; 3. The pollution of the atmosphere in traffic centers of large cities Abroad; 4. Air pollution caused by the exhaust gases from the automobile in Paris and its environs; 5. Survey of investigations of the air conducted in Zurich from 1961 to 1965; 6. The pollution of the atmosphere-observations in Switzerland; 7. Effects of exhaust gases on humans, animals, and plants; 8. The influence of the fuel composition; 9. Traffic sanitation and hygiene of the air; and 10. Police regulations and their enforcement. Pollution of the atmosphere by motor vehicle exhaust gases in Switzerland is emphasized.##

11492

Polyak, V. E.

ATMOSPHERIC POLLUTION BY NITROGEN OXIDES IN THE MANUFACTURE OF SULFURIC ACID BY THE TOWER PROCESS. ((Zagryaznenie atmosfernogo vozdukha okislami azota pri bashennom proizvodstve sernoi kisloty.)) Hyg. Sanit. (English translation of: Gigiena i b8sanit.), 33(4-6):266-267, April-June 1968.
CFSTI: TT 68-50449/2

An investigation of atmospheric pollution by nitrogen oxides (tail gases from the plant for the manufacture of sulfuric acid by the tower process) at various distances from the pollution source was made. The gases are discharged into the atmosphere by a chimney 40 m tall. The daily discharge into the atmosphere amounts to 4 tons of nitrogen oxides (expressed as nitric acid), with a gaseous volume of 817 cu m. There are no other discharges of nitrogen oxides on the factory premises or elsewhere in the district. Air was sampled at a level of 1-1.5 m from the ground, in the direct vicinity of the chimney, and at distances of 500, 1,000, 3,000 and 6,000 m, the total number of samples being 413. Measurements were made of the temperature, relative humidity and velocity of the air and of the barometric pressure, wind direction, cloudiness, and the color and movement of the visible "tail" of the gas discharge. Nitrogen oxides were detected and determined at the laboratory in most samples (79-89.3%). In a considerable number of samples the concentration of nitrogen oxides exceeded the maximum permissible concentration, including some samples taken at large distances from the discharge site (3,000 and 6,000 m). All minimum concentrations were either equal to or lower than the maximum permissible concentration, but the maximum concentrations exceeded this level. The mean concentrations of nitrogen oxides likewise exceeded the maximum permissible concentration, being 2.45 mg/cu m at the distance of 6,000 m, i.e., eight times the maximum permissible concentration.##

11562

Ewald, Herbert and Gustav Emrich

ANALYSIS OF THE INTERESTING COMPONENTS OF EXHAUST GASES. ((Die Analytik interessierender Abgasbestandteile von Auspuffgasen.)) Text in German. Freiberger Forschungsh., (A387):133-161, 1966. 146 refs.

Recent methods for the determination of CO, CO2, NO, NO2, hydrocarbons, and hydrocarbon combustion products in air and exhaust gases are reviewed in detail, with a discussion of their relative sensitivity, accuracy, and convenience. Data are also presented on the concentrations of some of these components during the operation of gasoline and diesel engines under various conditions. The sensitivity of various methods for the determination of some of these components and the prices of some of the analytical equipment (gas chromatographs, mass spectrometers, photometers, other spectrometers, and gas analyzers) required are given in tabular form. It is concluded that rapid testing or testing performed in mobile laboratories usually must be made by Orsat analysis or test capsules, while continuous measurements of exhaust gas components for control purposes can be done photometrically. For most purposes, ultraviolet and mass spectrometery have been replaced by gas chromatography, which is cheaper and more informative; however, spectrometric techniques are useful for identifying component detected by gas-chromatograph. Although basically a discontinuous process, gas chromatography can be automated.##

12161

McKee, Herbert C. and George C. Lawrason

A STUDY OF ETHANOL-GASOLINE BLENDS AS AUTOMOTIVE FUEL. Preprint, Southwest Research Inst., San Antonio and Houston, Texas, 11p., 1964. (Presented at the 57th Annual Meeting of the Air Pollution Control Association, Houston, Texas, June 21-25, 1964.) paper 64-76.

An investigation of ethanol-gasoline blends as a fuel for modern automotive engines was undertaken. Primary emphasis in the early phases of the program was devoted to determining the operating characteristics of typical automobile engines with various amounts of ethanol added to conventional gasoline. Along with this investigation, a few preliminary tests were made to determine the amount of unburned organic vapor emitted in the exhaust, comparing the emission of an ethanol-gasoline blend with the emission of a leaded gasoline of the same octane number. It was immediately evident that a significant reduction in hydrocarbon concentration occurred with the ethanol-gasoline blends, and additional work was performed to investigate this particular factor in more detail. It is concluded, however, that before a large scale change in fuel composition are undertaken, several factors needed extensive investigation.

12176

Landen, Ernest W.

NITROGEN OXIDES AND VARIABLES IN PRECOMBUSTION CHAMBER TYPE DIESEL ENGINES. Preprint, Society of Automotive Engineers, Inc., New York, 11p., 1963. 8 refs. (Presented at the Soc. Automotive Engrs. International Summer Meeting, Montreal, Canada, June 10-14, 1963.)

Nitrogen oxides produced in the combustion of compression ignition engines are of some significance because they are quite reactive and can attack lubricating oils and engine parts. Measured amounts in the exhaust gases of diesel engines can be used to evaluate those factors in operation and design which are important in controlling the quantities produced. In the precombustion chamber type of diesel engine, the local peak combustion temperature influences the formation of nitrogen oxides. These localized peak temperatures are controlled by such factors as fuel-air ratio of combustion, duration of fuel injection, timing of fuel injection, inlet manifold air temperature, engine speed, and supercharging. Data presented indicate how these variables affect the formation of nitrogen oxides as measured in the exhaust gases. Higher inlet temperatures and more rapid mixing of the fuel and air than is used in today's precombustion chamber engines are conducive to the formation of larger quantities of nitrogen oxides.

12521

R. U. Ayers

ALTERNATIVE NONPOLLUTING POWER SOURCES. S.A.E. (Soc. Automot. Engrs.) J., 76(12):40-80, Dec. 1968.

An urban transportation crisis grips the nation--its symptoms: thickening pollution, rising accidents, and ever increasing congestion. Currently, emissions appear to be the most pressing problem, therefore, responsible engineers must now consider alternative nonpolluting power sources. External combustion engines with steam or another fluid as the working medium are available now as an economic alternative to the internal combustion engine. The major virtue of the external combustion engine is an almost complete lack of emissions without compromise of engine performance. Steam engines offer simplifications in power train design as they possess high torque at zero speed eliminating the need for a transmission. In hybrid systems, a small, constant speed internal combustion or external combustion engine drives a high-speed alternator-invertor which both powers electric motors at the wheels and charges a battery. While overall efficiency would equal that of present engines and emissions would be drastically reduced, the cost penalties for private automobiles would be substantial. Therefore, the use of hybrid systems appears likely only for specialized situations which might include trucks and buses. Electric propulsion systems based on lead-acid batteries are possible now for small, limited performance vehicles. If high energy batteries become an economic reality, small cars comparable to the Volkswagen and Renault will become possible. With the development of low cost fuel cells, fuel cell-battery hybrids will present an attrative alternative since the introduction of the fuel cell into the system would give these vehicles a much needed increase in range. The present state of development and a careful overview of the potential of these alternative energy systems is presented in detail.##

12557

Wood, F. A.

SOURCES OF PLANT-PATHOGENIC AIR POLLUTANTS. Phytopathology, 58(8):1075-1084, Aug. 1968. 27 refs.

Sulfur dioxide, fluoride, ozone, and peroxyacetyl nitrate are currently the most important plant-pathogenic air pollutants in the USA. These or their precursors emanate from transportation, industry, or generation of electricity. The increase in population and in our demands for energy will result in increased activity within each of these categories and attendant increases in pollutant emissions. Thus, in all instances, the problem is going to worsen within the next 20 years. By 2000 AD or shortly thereafter, there should be a reduction in the levels of SO2 to present levels; the fluoride pollution problem will probably be worse; and, unless a power plant such as the electric engine is developed to take the place of the gasoline engine, our major problem will probably be one of photochemical air pollutants. It is also quite likely that pollutants such as hydrogen chloride and chlorine will increase in importance in the future. Finally, it should be kept in mind that the accuracy of predictions of this type is subject to changes in attitudes and technology. (Author's summary)##

12637

W. Teske

EMISSIONS AND ABATEMENT OF OXIDES OF NITROGEN IN NITRIC ACID MANUFACTURE. Chem. Eng., No. 221, CE263-266, Sept. 1968.

The emission problem in the manufacture of nitric acid results from incomplete conversion of nitrous oxide to nitric acid. Some of the processes for reducing the emissions which are discussed briefly include: Alkaline absorption with milk of lime or aqueous ammonia; oxidation with hydrogen peroxide or ozone; absorption in an aqueous solution of magnesium oxide; removal as nitrosylsulfuric acid by treatment with a sulfuric acid, nitric acid mixture; and catalytic reduction processes.##

12967

Saito, Takeshi

INFLUENCE OF FUEL TYPES OF COMPOSITION OF AUTOMOTIVE ENGINE EXHAUST. (Jidosha haiki gasu ni oyobosu nenryo sosei no eikyo). Text in Japanese. Nenryo Kyokai Shi (J. Fuel Soc. Japan), 48(3): 148-159, 1969. 8 refs.

A continuation of the investigation of the influence of different fuels on the composition of automotive engine exhaust constituents is reported. The relations between the olefin content of fuel and exhaust constituents are experimentally shown using an internal combustion engine on a dynamometer block. Test fuels included two gasolines of different olefin content, commercial

LPG, and pure propane. Carbon monoxide, hydrocarbons, N2, O2, CO2, H2, and nitrogen oxides were analyzed by gas chromatography. Unsaturated olefins were detected with an absorber reported by W. B. Innes. A special sampling apparatus using a magnetic bulb was constructed for analysis under acceleration. A hydrogen flame ionization detector was used for hydrocarbon analysis; molecular sieve and active charcoal were used for inorganic analyses; phenol disulforic acid was used for nitrogen oxide determinations. Analytical data are shown for various engine loads and speeds. It is concluded that CO concentration depends on air-fuel ratio only and is not influenced by fuel composition. Differences in total hydrocarbon content of exhausts from different fuels are quantitatively small, but unsaturated hydrocarbons, which contribute to air pollution reactions, increase slightly with the fuel olefins.

12990

Gruson, G. and E. Hanke

PROBLEMS OF THE REMOVAL OF NITRIC OXIDE IN ELECTROSTATIC PRECIPITATORS. (Probleme der Stickoxidentfernung beim Elektrofilterbetrieb). Text in German. Freiberger Forschungsh. A, no. 413:37-73, 1967. 36 refs.

The problem of the nitric oxide formation in electrostatic precipitators was studied both by an extensive literature search and by experiments. It is well known that NO is involved in the precipitation of tars and rosins in electrostatic precipitators used in gas works. However, it is less known under what circumstances NO is produced or destroyed by the effect of high potentials. Nitric oxide measurement techniques and theoretical understanding of the processes are therefore of economic significance for gas works. After a discussion of the partially contradictory results reported in the literature, measurements in a gas and a coke plant are described which prove that electrostatic precipitators for tar increase the NO concentration and thereby the tar content of the gas. The Ilosvay method used for the NO measurements is described, as well as the preparation of NO samples for its calibration. In this method, the NO in the gas is first oxidized to NO2 by KMnO4. The NO2 is then scrubbed by the Ilosvay solution consisting of sulfanilic acid and alpha-naphthylamine. The reaction produces p-benzenesulfonic acid-azo-alpha-naphthylamine, which is measured photometrically. This method detects 50.0% = or - 1.2% of the NO. As results of experiments with electrostatic precipitators, the formation of NO as a function of the potential with various model gases is reported. At O2 concentrations between 0.4 and 1.5%, both NO and NO2 are formed at potentials up to 60 kV. In the presence of up to 8 g ammonia per cu m, only NO (up to 80 cu cm/cu m) was formed. The significance of these results, together with the research findings reported in the literature, is discussed.

13547

Spindt, R. S., Court L. Wolfe, and Donald R. Stevens

NITROGEN OXIDES, COMBUSTION, AND ENGINE DEPOSITS. J. Air

Pollution Control Assoc., 6(3):127-133, Nov. 1956. (23) refs.

Experimental studies were conducted with single and multiple cylinder engines to determine how the concentration of nitrogen oxides in the exhaust gas varied with operating conditions. Chemical analysis of the exhaust gases verified theoretical conclusions that appreciable nitric oxide should be formed in the combustion process. It was found that nitric oxide always increases with increasing intake pressure, independently of any other fixed variable. In general, the effect of increasing speed is to reduce the amount of nitric oxide because of the decrease in reaction time. The amount of nitric oxide present is controlled by throttle settling and air-fuel ratio. The amount is low at full throttle, rich mixture conditions, but increases at part throttle due to leanness of the mixture. It is concluded that engines operating under normal spark timings with mixtures on the lean side of stoichiometric will produce appreciable nitric oxide, the amount formed depending on the load applied. There appears to be little hope of reducing nitrogen oxides by changes in engine conditions, since optimum economical operation seems to be in the range of high nitrogen fixation.

13562

Chandler, J. M.

EFFECTS OF ENGINE-OPERATING VARIABLES ON THE COMPOSITION OF AUTOMOTIVE EXHAUST GASES. Proc. Am. Petrol. Inst., Sect. III, 38:324-335, 1958. (Based on a report of the Variables Panel of the Coordinating Research Council Group on composition of exhaust gases, Aug. 1957.)

The effects of engine variables on the concentrations of hydrocarbons and nitrogen oxides in automotive exhausts are discussed. The factors affecting hydrocarbon concentration in exhaust gas are manifold vacuum, engine detuning, and cold as compared to hot engine starting. Manifold vacuum of more than 21.5 in. of mercury accounts for high hydrocarbon concentrations during deceleration. This effect is accentrated by manual transmissions as compared to automatic. Enriched carburetor idle setting increases hydrocarbon emission at cruising speeds up to 30 mph. Spark-plug condition is important because one misfiring plug may more than double the average hydrocarbon concentration. Among the variables affecting nitrogen oxides, air-fuel ratio is of primary importance. Lean mixtures promote the formation of nitrogen oxides and increase the effects of other engine variables. Under full throttle, rich mixture conditions, the concentrations are relatively low. Under road-load cruise conditions and during fuel throttle accelerations, higher speeds produce higher concentrations. During part-throttle accelerations, speed has no effect, and high concentrations may be exhausted even at low speeds. During idling and deceleration, nitrogen oxides concentrations are so low as to be considered insignificant.

13628

Shibuya, Toshikazu

ENGINE PERFORMANCE SEEN FROM THE EXHAUST SMOKE DENSITY OF SINGLE

CYLINDER DIESEL ENGINE. 2ND REPORT. DEPENDENCE OF AIR-FUEL RATIO AND PRODUCTS OF COMBUSTION ON THE EXHAUST SMOKE DENSITY. (Haikien nodo yori mita tanto diesel kikan seino. Dai 2 ho. (Haikien nodo to kuku-nenryo hi, oyobi haiki gasu sosei.) Text in Japanese. (Shiga Kenritsu Tanki Daigaku Gakujutsu Zasshi (Scientific Reports of Shiga Prefectural Junior College)), no. 8:1-5, March 1967. 12 refs.

Relationships among air-fuel ratio, smoke density and concentration of some components of exhaust gas from a single cylinder diesel engine running at low speeds were investigated with an air-fuel ratio meter and a gas detector. The measurement of exhaust smoke density vs. air-fuel ratio at 900, 800 and 750 RPM shows that, for each speed smoke density increases rapidly from relative minimum points. These minimum smoke densities are between 2.7 and 2.8 at air-fuel ratios of 26, 28 and 33:1 for 900, 800 and 750 RPM, respectively. Decreasing engine speed increases smoke density for any given air-fuel ratio. The results of the experiments on the effect of air-fuel ratio on CO, SO2, and NO2 emission showed that CO is minimum at an air-fuel ratio of about 26:1. It increases rapidly at lower ratios and at 22:1 reaches 0.01%, the so-called maximum permissible value for CO. Carbon monoxide concentration exceeds 0.01% at light engine loads. Sulfur dioxide rapidly increases and exceeds 10 ppm (maximum permissible value) at air-fuel ratios lower than about 22:1. It decreases at higher ratios. Nitrogen dioxide concentration is minimum at an air-fuel ratio of about 23, increasing at both higher and lower ratios. Its concentration is always lower than 25 ppm, the maximum permissible value. It is proposed that an output at a smoke density of 2.7-2.8 or an air-fuel ratio of 26-27 be used as a normal output and an output at a smoke density of 3.3-3.4 or an air-fuel ratio of 22 be used as a maximum, when determining emissions from small diesel engines.

13698

Mohrnheim, Anton F.

AIR POLLUTION AND THE METAL FINISHING INDUSTRY. Plating, March 1969.

The role of nitrogen oxides in air pollution is discussed in order to inform those who work with nitric acid and aqua regia of their capacity for creating or preventing air pollution. Nitrogen dioxide itself is toxic and, in addition, contributes to chemical smog production through a photochemical chain reaction. Even though the metal manufacturing and finishing industry uses larger quantities of nitric acid than the precious metal industry, the latter may release comparable amounts of nitrogen dioxide. This is demonstrated by the quantititive reaction of gold and nitric acid. In the precious metal industry, closed systems should be used with only stoichiometric amounts of aqua regia. For pickling and similar work in the metal manufacturing and finishing industry, mist collectors or air scrubbers should be used.

13952

Lindberg, Walter

AIR POLLUTION IN NORWAY. I. THE GENERAL AIR POLLUTION IN

NORWEGIAN CITIES AND INDUSTRIAL TOWNS. (Den alminnelige luftforurensning i Norge. I. Generelt om luftforurensning i byer og tettbygde strok.) Translated from Norwegian. Oslo Univ. (Norway), p. 1-65, 1968. 12 refs

General information is presented on air pollution in Norway with attention focused on (1) the sources and types of pollutants: motor vehicles, heating plants, incinerators, (2) air pollution levels in the cities, including dustfall, SO2, and smoke measurements in Oslo, Sweden, (3) special investigations (sulfuric acid fog), the chemical composition of solid particulates in smoke and suspended dust, polynuclear hydrocarbons and particulates, trace elements, (4) pollutants in Norwegian cities other than Oslo, (5) directions for medicohygienic evaluation of pollution levels in cities and other densely populated districts and industrial regions, and (6) an evaluation of the economic consequences of air pollution.

13988

Starkman, E. S.

BASIC PROCESSES DURING FORMATION OF OXIDES OF NITROGEN AND CARBON MONOXIDE IN INTERNAL COMBUSTION ENGINES. (Grundlegende Vorgaenge bei der Entstehung von Stickstoff- und Kohlenmonoxid in Verbrennungskraftmaschinen). Text in German. ATZ (Automobiltechnische Zeitschrift) (Stuttgart), 71(4):130-134, 1969. 12 refs.

Recently-developed emission and absorption spectroscopic methods for the instantaneous determination of combustion gas composition in operating internal combustion engines enable one to record the variation of the concentrations of NO and CO in the course of an engine cycle. Measurements carried out by these methods show that the commonly used assumption that the actual NO and CO concentrations are close to their theoretical equilibrium values at any given temperature is quite inadequate, as the actual values are invariably much higher than the theoretical values. Similar findings apply to exhaust gas compositions of gas turbines. The author points out that as the fuel-to-air ratio in an internal combustion engine is increased, the NO and CO concentrations in the exhaust gas decrease and increase, respectively. This suggests the theoretical possibility of drastically reducing the concentrations of both by operating the engine with a fuel-to-air ratio for which the NO and CO concentrations in the exhaust gas are numerically equal and by inducing these two constituents to interact according to the equation: 2NO plus 2CO yields N2 plus 2CO2. The practical realization of this idea rests on the possibility of developing engines capable of operating at the required fuel-to-air ratio, carburetors capable of maintaining the required fuel-to-air ratio at the prevalent operating conditions, and catalysts or other means of facilitating and accelerating the above reaction.

14026

Starkman, E. S., H. E. Stewart, and V. A. Zvonow

AN INVESTIGATION INTO THE FORMATION AND MODIFICATION OF EMISSION

PRECURSORS. Preprint, Society of Automotive Engineers, Inc., New York, 9p., 1969. 15 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690020.)

A detailed observation of the mechanisms by which undesirable products of combustion are formed and modified during residence in the engine cylinder was attempted. A hydraulically actuated sample valve, different from the electrically or mechanically driven ones involved in previous studies, was utilized. The combustionchamber of a spark ignition engine was sampled directly with a hydraulically actuated and controlled valve. This resulted in increased flexibility in sample size and in the time of acquisition, and thus permitted a much more comprehensive history of combustion gas composition to be obtained. The cold wall was found to influence equally carbon monoxide, carbon dioxide, and nitric oxide formation, as it has been previously shown to influence unburned hydrocarbons. Results indicated that sample fraction should be at least 1% of cylinder content if the chemical analysis is to reflect conditions away from the wall reliably. There was evidence that large gradients in composition are created across the combustion chamber and these gradients persist throughout the expansion. Examination of engine operating variables, such as spark advance, compression ratio, mixture strength, and speed, provided more evidence of the role which chemical kinetics plays in determining the concentration of nitrogen oxides appearing in engine exhaust.

14033

Pahnke, Alden J. and James F. Conte

EFFECT OF COMBUSTION CHAMBER DEPOSITS AND DRIVING CONDITIONS ON VEHICLE EXHAUST EMISSIONS. Preprint, Society of Automotive Engineers, Inc., New York, N. Y., 24p., 1969. 15 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690017.)

Hydrocarbon exhaust emission levels of new cars driven under consumer-type conditions increase during the initial 5000 to 10,000 miles of operation; the magnitude of the increase is less with vehicles equipped with exhaust control systems. The role of combustion chamber deposits in increasing hydrocarbon exhaust emission levels during the initial period of vehicle operation was considered. Analyses have shown these deposits to contain high concentrations of lead salts originating from the combustion of lead alkyls present in gasoline. Two consumer-type vehicle tests to determine the effect of leaded and unleaded gasoline on exhaust emissions were completed. One test involved 122 cars without exhaust control systems and the other, 36 cars with exhaust control systems. In both tests, hydrocarbon exhaust emissions of the leaded and unleaded cars increased during the initial period of mileage accumulation and then leveled out as equilibrium was reached. Average hydrocarbon emission levels of the leaded cars were higher than those of the unleaded cars with the difference or net lead effect amounting to 7% in both the 122-car and the 36-car tests. No significant differences in carbon monoxide or nitrogen oxide emission levels were observed. Photochemical reactivity levels were essentially the same for the leaded and unleaded car groups in the two tests. A limited study of the effect of mileage accumulation conditions on exhaust emission levels was carried out. Results obtained under rapid or accelerated mileage accumulation conditions did not correlate with consumer test results. (Author abstract modified)

14116

Hurn, R. W.

AIR POLLUTION AND THE COMPRESSION-IGNITION ENGINE. Preprint. Combustion Institute, Pittsburgh, 14p., 1968. 9 refs. (Presented at The Combustion Insts Twelfth International Symposium on Combustion, Poitiers Univ., France, July 14-20, 1968, Paper 61-7.)

The compression-ignition engine, popularly known as the diesel, is examined as a contributor to metropolitan air pollution. Smoke and odor are recognized as the primary targets of public objection to the diesel, and factors relevant to the smoke and odor problem are discussed. Problems of diesel smoke are seen as readily manageable, but a satisfactory solution to the diesel odor problem is not yet available. Other pollutants, e.g., unburned or partially burned hydrocarbons, oxides of nitrogen, and carbon monoxide, are significant products of diesel combustion. Of these, only nitrogen oxides and possibly the aldehydes are typically discharged in quantities that in equivalent volumes may exceed the quantities discharged by spark ignition reciprocating internal combustion engines. Features unique to the diesel combustion process are discussed as factors relevant to generation or avoidance of objectionable pollutants. The high temperatures and oxygen availability in diesel combustion are seen as serious impediments to satisfactory reduction of the yield of nitrogen oxides, but they are favorable in holding concentrations of pollutants in other categories to acceptable low levels. To compound this advantage, the diesel has advantages both in fuel economy and in higher heat value of diesel fuel compared with lighter fuels. Thus, it would appear that diesel power offers an excellent opportunity for continued and expanded application to meet increasingly stringent clean air requirements. (Author abstract modified)

14127

Stone, R. K. and B. H. Eccleston

VEHICLE EMISSIONS VS. FUEL COMPOSITION. Preprint, American Petroleum Institute, Montreal, Can., Div. of Refining, 50p., 1968. 9 refs. (Presented at the Session on Air and Water Conservation, 33rd Midyear Meeting of the American Petroleum Institute Division of Refining, Philadelphia, Pa., May 16, 1968, Preprint No. 43-68.)

Reduction of evaporation losses from motor vehicles was investigated as a means of lessening the amount of pollutants reaching the atmosphere. The effect of fuel volatility and of front-end fuel composition on the quantity, composition, and photochemical reactivity of vehicle emissions including both tailpipe and fuel-system losses were studied. In addition, the test variables included engine fuel-system features and ambient temperature, which was varied over a range of 20-95 F. Results of tests on eight 1966 model cars are given.. Driving cycle and instrumentation typical of current practices for emission studies were used. Test results showed that at high ambient temperatures, a large reduction in evaporation losses accompanied a reduction in front-end fuel volatility. However, there was also a small adverse effect on exhaust emissions from volatility reduction. Reactive hydrocarbon emissions from evaporation were reduced substantially by either volatility reduction or saturation of light olefins. Light olefin reduction also reduced exhaust reactivity. Carbon monoxide emissions showed a small increase as fuel volatility was reduced, while nitrogen oxides and aldehydes showed no significant fuel effect. (Author abstract modified)

14619

Cejka, Milan

DIESEL ENGINE EXHAUST GASES. (Vyfukove plyny z naftovych motoru). Text in Czech. Ropa Uhlie, 9(6-7):208-211, 1967.

Composition of engine exhaust gases depends largely on the fuel-air ratio, which varies in accordance with the loading of the engine from 18:1 to 100:1, and this greatly influences the combustion process. In addition, the content of exhaust gases is determined by the shape of the combustion chamber, the type of fuel injection, whether the engine is two or four stroke, habits of the driver, etc. Analysis gave evidence of 47 different compounds in engine exhaust gas. Nitrogen oxides comprised 40-85% of the emissions from diesel engines compared to 10% from combustion engines. The content of aldehydes in smoke is the main cause of toxic effects in humans. It is believed that lighter fuels reduce smoke, but they yield more irritant compounds. In a garage for 200 buses whose engines were in good condition, the measured concentration of carcinogens was 2.7 to 2.9 micrograms/100 cu m, which is less than values found in ambient air from burning coal. The setting of maximum allowable concentration standards is very difficult because of the wide range of individual reactions to engine exhausts. Reduction of pollution may be effected by supplying specially treated fuel with low sulfur content, after burning of gases as practiced in the U. S., and regular inspection of engines.

14892

Durrant, T.

TOWARDS CLEANER SKIES. Aeroplane, 116(2966):16, 20-21, Aug. 21, 1968.

The main contaminants produced by aircraft burning kerosene fuels are exhaust smoke, unburned hydrocarbons, carbon monoxide, and sulfur and nitrogen oxides. The presence of smoke in the engine exhaust is a failure to control carbon production or consumption processes or both, but experience has shown that elimination of smoke is difficult at increased engine pressure ratios. By changing combustion-chamber design and including airspray fuel injectors, it is expected that new large transport gas-turbine engines will have a barely visible level of smoke emission. Annular chambers now being introduced have a smaller flame tube wall surface area and therefore use less cooling air than the tuboannular system. Consequently, unburned hydrocarbon and carbon monoxide concentrations at idle and taxi conditions will be lower on new engines than on those currently in service. The most difficult contaminants to control are nitrogen oxides, although concentrations are low compared with the automobiles. Intensive investigations are being conducted to reduce these emissions; it is suggested that one method of reducing their concentration may be by running with a richer primary combustion zone, although this is contrary to smoke-control requirements and would involve design compromises.

14924

Sawyer, R. F., L. S. Caretto, and E. S. Starkman

THE FORMATION OF NITRIC OXIDE IN COMBUSTION PROCESSES. Preprint Abstract, Combustion Institute, Pittsburgh, 2p., 1968. 7 refs. (Presented at the Combustion Inst., Central States Sect., Tech. Meet. on Pollut. Problems Associated with Combust., Columbus Ohio, March 1968.)

Nitric oxide (NO) formation was investigated in several combustion environments including laboratory burner flames, stirred reactors, gas turbine combustor models, piston engines, and industrial and aircraft gas turbines. Hydrocarbon and ammonia fuels were studied with air as the oxidizer. Theoretical considerations were based upon both equilibrium and kinetic models in attempts to predict the composition of the combustion products for comparison with the experimental observations. Although the differences in the observed NO concentrations in different combustors seemed to emphasize the strong influence of combustor design, some trends were present which may be explained on the basis of theoretical arguments. From equilibrium composition calculations, the concentration of NO in combustion products was shown to be strongly dependent upon both the mixture ratio and product temperature, but not upon the combustion pressure. Kinetic processes prevent the equilibrium of NO concentrations in expansion of combustion products. Recent evidence indicates that NO formation is kinetically controlled in some combustion processes and that concentrations may fail to reach or, in some cases, even exceed equilibrium predictions. Studies of premixed ammonia oxygen flames in a porous plug burner reveal NO at greater than predicted equilibrium concentrations. The singular role of nitrogen from ammonia in the formation of oxide is under current investigation. NO concentrations in a well-stirred reactor, ammonia combustion in a reciprocating engine, and NO infrared emission during the expansion process were recently measured. High NO levels were indicated. Measurement of nitric oxide from gas turbine combustors indicate that NO concentrations depend strongly upon the combustor configuration and even possibly upon the temperature-time history of the products in the turbine and exhaust systems. Studies of piston engine expansion processes show NO levels to be frozen early in the expansion process; concentrations are not simply related to the equilibrium levels predicted for peak cycle temperatures. (Author abstract modified)

15043

Los Angeles County Air Pollution Control District, Calif.

INITIAL BRIEF OF THE AIR POLLUTION CONTROL DISTRICT OF THE COUNTY OF LOS ANGELES. (Presented before the U. S. Federal Power Commission in the Matters of Transwestern Pipeline Co., Docket no. CP63-204, CP64-91; El Paso Natural Gas. Co., Docket no. CP64-76; Gulf Pacific Pipeline Co., Docket no. CP63-223. 46p., 1965.)

Evidence is presented indicating that fuel oil burning by industry and power plants is seriously affecting public health in Los Angeles and could lead to a major disaster. To combat this acute air pollution problem, industry and power plants must be provided with year-round natural gas service at higher levels than those of Pacific Lighting's Tailored Supply Program. Unless the power plants and industry can change to a cleaner fuel, sulfur dioxide and nitrogen oxide levels, which already exceed most modern recommended standards, will increase dramatically in the next 15 years. These pollutants in combination with sulfates and particulates are contributing causes of severe respiratory illness. Other air pollution problems wholly or partially attributable to fuel oil burning are damage to vegetation and property, reduced atmospheric visibility, and aggravation of photochemical smog. If natural gas were substituted for fuel oil, daily emission of nitrogen oxides could be reduced by 85 tons, sulfur dioxide by 410 tons, and particulates by 31 tons. The peak periods for these pollutants are December, January, and February, refuting the contention of oil and gas companies that pollution is not a problem in winter.

15310

Friedlander, S. K. and J. H. Seinfeld

A DYNAMIC MODEL OF PHOTOCHEMICAL SMOG. Environ. Sci. Technol., 3(11):1175-1181, Nov. 1969. 19 refs.

A simplified kinetic scheme is proposed as a dynamic model for photochemical smog reactions. Unlike previous diffusion models, which have been concerned with nonreacting pollutants, the formulation of this model takes into account both the chemical reaction and turbulent mixing aspects of the photochemical smog problem. In the first part of the paper, a simplified kinetic mechanism is presented for the formation of photochemical smog from nitric oxide and unburned hydrocarbons. In the second part, diffusion models based on the general equation of conservation of species are discussed. The model is a combination of the transport and chemical kinetic equations and predicts the behavior of a reacting pollutant cloud. The roles of sulfur oxides and aerosols are not considered. Calculations basedon the model lead to concentration dependence on time, similar in form to the experimental results for laboratory reaction chambers. The Lagrangian similarity hypothesis for the diffusion of nonreactive components is extended to reacting species to take into account the effect of atmospheric mixing. This leads to a set of ordinary differential equations for the reactive species of the type describing a chemical reactor of variable volume. As a preliminary example of the application of the model, a calculation was made for a single bimolecular reaction.

15399

NATURE AND CONTROL OF AIRCRAFT ENGINE EXHAUST EMISSIONS.
Northern Research and Engineering Corp., Cambridge, Mass.
Contract PH22-68-27, Report 1134-1, 388p., Nov. 1968. 208 refs.

The results of a study of the emissions of air pollutants by aircraft engines in the U. S. are presented. The study included four aspects of aircraft engine emissions: the nature of aircraft engine emissions and quantities emitted, the effects or impact of aircraft engine emissions on the populace, the reduction of emissions, and governmental control of the emissions. In addition, emission control requirements were considered and guidelines developed for determining the degree of control needed. The principal conclusion drawn from the study is that the nature and extent of air pollutant emission by aircraft can be assessed with sufficient accuracy to allow a comparison between aircraft and other emissions sources. On that basis, aircraft are a small contributor of pollutants in metropolitan areas. In the vicinity of air terminals, however, the density of pollutant emission by aircraft and the resulting pollutant concentrations are comparable to emission densities and concentrations in adjacent communities of the same pollutants from other sources. Thus, the principle impact of aircraft is local in nature and is expected to become more severe in future years. It is also likely that aircraft emissions will constitute a more significant portion of community-wide pollutant loadings as new aircraft are introduced and as emissions from other sources are reduced. It is further concluded that whenever a reduction of aircraft emissions becomes desirable, a variety of practical approaches exist to reduce both the quantities of pollutants emitted and their impact on the community. Specific conclusions relative to emission reduction and emission control are presented. A program of activity with regard to aircraft emission is recommended. All emission data is tabulated.

15452

Smith, Ralph I.

AIR-POLLUTION PROBLEMS OF THE PHOSPHATE INDUSTRY. (Bureau of Mines and Geology, Montana, Western Phosphate Region, Proc. Ind. Seminar West. Phosphate Reg., Butte, Mont., 1966, p. 46-48, June 1967. (Special Pub. 42).

Materials from the phosphate industry which contribute to air pollution are listed as follows: solids, such as natural dust and organic particles, industrial dusts such as carbon and fly ash from the combustion of fuels, and fine dusts; gases, such as sulfur dioxide and trioxide, hydrogen fluoride, silicon tetrafluoride, chlorine, hydrogen chloride, carbon monoxide and dioxide, nitrous and nitric oxide, ammonia, alcohols, and ozone;

and water vapor and mists, which are liquid from condensation of water and acids on suitable nuclei. The noxious gases come from two sources in the phosphate industry: a wet process called denning, and from calcination processes. As the gases or smoke come out of the stack, they may either continue upward, spread out and diffuse, or an inversion or turbulence may cause a rapid downward trend a short distance from the stack. Smoke and fumes have both psychological effects (depression and general irritation) and physiological effects (the irritation of membranes of the nose, throat, and lungs by the inhalation of gases; a toxic effect in the stomach of animals who eat contaminated vegetation). Methods for the removal of solids are listed as follows: a long flue equipped with baffles and settling chambers; a filtering system such as a bag house; and the cyclone. The most economical and effective way of removing noxious gases is by scrubbing. Sulfur gases may also be sent through a sulfuric acid plant. Fluorine gases may be removed by forcing the gases through a bed of limestone; the absorption causes a chemical reaction to take place, forming inert calcium fluoride. Other removal methods mentioned include the following; electrostatic precipitation; and sonic precipitation.

15599

Vendramini, R., G. G. Calapaj, and G. Rausa.

A CHEMICAL AND STATISTICAL STUDY ON THE POLLUTION OF THE INTERNAL ATMOSPHERE OF THE AUTOVEHICLES FROM EXHAUSTED GASES. (L'inquinamento da gas di searico nell'atmosfera interna degli autoveicoli.). Text in Italian. L'Igiene Moderna, 62(1-2):3-26, Sept. 1969. 31 refs.

In the metropolitan area of Padua, Italy, and on national and local high-ways branching out from this city, data was collected for two seasonal periods: Autumn-Winter (October 1967 to February 1968) and Spring-Summer (March to July, 1968). Urban traffic conditions were classified in three categories: free-flowing (on wider streets outside rush hours), medium (same streets during rush hours), and sluggish (during rush hours on streets less than six meters in width and with a large number of traffic signals). Test automobiles were equipped with two pumps, one at a low level and one at a high level, which gave readings of atmospheric content between the two front seats. A N/10 solution of sodium hydroxide was used to trap formaldehyde and nitrogen oxide, while 1/1000 palladium chloride was used to detect carbon monoxide. The upper pump drew about 20 liters per minute of air through a SS 602/h paper filter, which captured lead from the air, this could then be extracted from the filter with nitric acid. Each sampling period lasted 10-15 minutes, during which time the vehicle was operated with closed windows, open vents, and no operating fans. All samples were collected on windless days. Results were expressed in ppm (carbon monoxide, nitrogen oxides, formaldehyde) and micrograms/mc (lead). Statistical analysis showed a relationship in the increase of other pollutants with respect to increased CO. Two indexes were calculated: the 'eta' of Cucconi and the 'rho' of Spearman. The other pollutants were found highly correlated with CO concentrations, regardless of seasonal variations. Presence of pollutants in the interior of motor vehicles was sufficiently high to cause hypoxia affecting vision and the higher centers of intellect.

15625

Tokyo Metropolitan Government, Japan, Public Nuisance Control Div.

THE EMISSION SOURCES OF NITROGEN OXIDE AND CHROMIC ACID AND THEIR STANDARD CONTROL EQUIPMENTS. (Chisso sankabutsu oyobi kuromusan misuto no hasseigen to sono hyojun jogai setsubi ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 3(7): 411-419, July 15, 1967.

Nitrogen oxides are emitted by nitric acid plants, sulfuric acid plants, certain kinds of chemical reaction apparatus, and metal surface treating plants. The metals which are treated with nitric acid are copper, aluminum, nickel, iron, and so forth. The nitrogen oxides which are generated by the reaction of metal and nitric acid are nitrous oxide, nitric oxide, nitrogen dioxide, nitrous anhydride, nitrogen peroxide, and nitric anhydride, the primary air pollutants being nitric oxide, nitrogen dioxide, and nitrogen peroxide. Nitric oxide is slowly oxidized by oxygen in the air. Poisoning from nitric oxide only has not been reported, but it is said to change active hemoglobin into an inactive one. Nitrogen dioxide and peroxide have a stinging odor, lower the blood pressure, and paralyze the nerves. High concentration of nitrogen dioxide above 100 ppm could cause human death. The allowable concentration of nitrogen dioxide is 5 ppm. Nitrogen dioxide is easily absorbed by water and becomes nitric acid, but nitric oxide must be oxidized before washing with water. Since the reaction rate of nitric oxide is very slow, some catalysts such as activated coal must be used. Chromic acid is generated almost exclusively by a chromium plating process. Hydrogen and oxygen gas generated by electrolysis release chromic acid into air, mainly in the form of chromium trioxide which is poisonous and injures the kidneys. The allowable concentration is 0.1 mg/cu m. Chromic acid mist can be absorbed easily by washing with water. The results by the above methods are the following: nitric oxide was reduced from 70,000 ppm to 36 ppm; nitrogen dioxide, from 650,000 ppm to 70 ppm; and chromic acid mist, from 42.65 mg/cu m to 0.077 mg/cu m.

15723

Faingold, S. G., A. M. Stanetskaya, L. A. Tretyakova, and N. S. Kipot

CAUSES OF THE FORMATION OF NITRIC OXIDE IN THE CARBONIZATION OF COALS. Coke Chem. (USSR) (English translation from Russian of Koks i Khim.), no. 2:23-28, 1969. 10 refs.

While confirming that nitric oxide is an inevitable product of coal carbonization, previous research has not established the extent to which carbonization participates in nitric oxide content of coke oven gas or its relationship to the nitrogen content of coal. To resolve these questions, as well as determine the nitric oxide content of coke-oven gas during carbonization, various coal blends and different grades of coal were carbonized in a gas-tight oven chamber at a pressure of 600-800 mm water gauge. The evolution of nitric oxide followed the same pattern for all blends and coals: the content reached a peak at 200-399 C, the beginning of carbonization, and the peak lasted until 400 C. The quantity of nitric oxide evolved was unrelated to the nitrogen content of the blends and coals. For example, one blend contained 2.36% nitrogen, and the dynamic mean nitric oxide content of the coke-oven gas equalled 2.83-3.67 ppm or 0.96-1.10 ml/kg for the blend. The nitrogen content of the blends ranged from 1.5-2.36%. The nitrogen content of coals varied less and the volatile matter differed sharply, but nitric oxide formation was the same as for blends. It is concluded that nitric oxide is formed as a result of reactions involving the liberation of oxygen from the air, introduced with the blend or coal and the oxygen-nitrogen-containing compounds in the coal.

15769

Pursall, B. R.

POLLUTION IN ROAD TUNNELS. Consulting Eng., 33(8):57-58, Aug. 1969. 9 refs.

The sources and causes of the build-up of pollutants in road tunnels are discussed. The two main sources of poisonous exhaust gases are gasoline and diesel engines. Diesel exhaust emits a smaller percentage of carbon monoxide than the gasoline engine, but because the diesel engine is larger, it emits a larger volume. The diesel engine also produces more nitric oxide and nitrogen peroxide. Vehicles emit up to 50% more carbon monoxide on the up-gradient than on the level; on the down gradient, they emit 40% less. In calculations for two-way tunnels, an average figure for carbon monoxide emission can safely be taken. Tests showed that the amounts of carbon monoxide and other combustion products vary directly with speed. Differences in tunnel concentrations for the Sumner Tunnel in Boston and the Central Tunnel in London were attributed to different vehicle speeds and variations between British and American vehicles and fuels. The variations resulted in higher concentrations of lead and hydrocarbons in the Sumner Tunnel; carbon monoxide concentrations were similar for average daytime periods in both tunnels. The effects of carbon monoxide, nitrogen oxides, and lead compounds are briefly discussed. It was concluded that if the concentration of CO can be diluted to below 100 ppm, the concentration of nitrogen oxides and other gases should be relatively harmless. Visibility should also be satisfactory under these conditions. In a 2 way tunnel, the maximum ventilation rate was calculated to be 200 cu ft/min/ft. With one way traffic, ventilation is induced from the portals by the moving vehicles, but additional artificial ventilation would be necessary when the traffic is stopped or moving slowly. In most large tunnels, alarms operate if the CO concentration exceeds 250 ppm.

ATMOSPHERIC INTERACTION

00130

AIR POLLUTION AND HEALTH. Am. Rev. Respirat. Diseases 93, (2) 1-12, Feb. 1966. (A statement by the American Thoracic Society Committee on Air Pollution).

The health hazards of air pollution are discussed in connection with the meteorological conditions that help to bring them about, techniques of air pollution measurement, and research on the biologic effects of exposure to air pollutants.##

00177

H. Buchberg, M. H. Jones, K. G. Lindh, and K. W. Wilson

AIR POLLUTION STUDIES WITH SIMULATED ATMOSPHERES. California Univ., Los Angeles, Dept. of Engineering. (Rept. No. 61-44.) July 1961. 185 pp.

Part I of this report deals with the statistical relations among interacting atmospheric variables. Also contained in this report are the results of several auxiliary or supporting studies as follows: Air Purification Studies; Development of an Eye Mask for the Measurement of the Threshold of Eye Irritation; Development of an Omnidirectional Solar Radiometer for a Limited Spectral Region Centered about 0.36 microns; A Comparison of Concentration and Duration as Measures of Threshold for Eye Irritation; A Comparison of Threshold to Eye Irritation Resulting from Reacted Air Mixtures Sampled at Different Points in the Exposure System; A Comparison of Odor Threshold and Eye Irritation Threshold for Formaldehyde, Acrolein, and Ozone. (Author)##

00302

A. P. Altshuller

ATMOSPHERIC REACTION STUDIES RELATED TO AIR POLLUTION. Arch. Environ. Health 8, 27-30, Jan. 1964.

Studies of air pollution in urban and adjacent rural areas by particles and trace gases need to be related to studies of composition of the earth's atmosphere. Man's activities generate pollutants which in themselves or through photochemical reactions contaminate the general atmosphere. Cooperative efforts need to be made by air pollution and atmospheric science laboratories to obtain monitoring data. Areas of such research in measurement of pollutants and nonpollutants, measurement methods, instrumentation, and biological and chemical effects are reviewed by the author. The proper selection of synthetic atmospheres for laboratory studies so that real conditions are reflected is emphasized. An important problem still requiring solution is the obtaining of support, personnel, and facilities for research and development on instrumentation for specialized applications.##

00344

W. L. Faith

RELATIVE REACTIVITY OF HYDROCARBONS IN PHOTOCHEMICAL SMOG FORMATION AND ITS PRACTICAL IMPLICATIONS. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-40.)

Adequate and intelligent control of photochemical smog requires a knowledge of the relative reactivity of the hydrocarbons emitted from motor vehicles and a method of measuring them. An extensive survey of the literature yields the following general classification of hydrocarbons: (1) reactive (all olefins and all aromatics except benzene and toluene) and (2) nonreactive (all paraffins, acetylene, benzene and toluene). Within the olefin series, there is a wide range of reactivity; ethylene is far less reactive than other olefin species. In fact, ethylene provides a good line of demarcation between reactive and unreactive compounds, so far as photochemical smog formation is concerned. A simple method of analysis that will distinguish between reactive and non-reactive hydrocarbons is sorely needed. At present, an instrument that would distinguish between olefins and nonolefins would be useful. (Author)##

00345

J. C. Romanovsky, R. M. Ingels, and R. J. Gordon

ESTIMATION OF SMOG EFFECTS IN THE HYDROCARBON-NITRIC OXIDE SYSTEM. Preprint. (Presented at the Air Pollution Control Assoc. Annual Meeting, June 20-24, 1966, San Francisco, Calif., Paper No. 66-42).

The complex role of nitric oxide in photochemical smog has led to conflicting conclusions concerning its relationship to end effects. The confusion has not been dispelled by the tendency to employ kinetic parameters of the photochemical reactions accompanying the formation of smog as indicators of the end effects. In an attempt to resolve these differences a detailed study was carried out to examine the effects of varying the concentrations and reactant ratios of NO and "hydrocarbon" on a number of smog effects as well as on various functions of the reaction rate. Hydrocarbon components increasing in complexity from propylene through a simulated auto exhaust to authentic auto exhaust were irradiated in the presence of NO in large chambers instrumented for measurements of numerous variables. Eye irritation was measured using a selected panel of human subjects; formation of ozone and formaldehyde was followed analytically. From other analytical data it was possible to derive half-lives for NO, NO2, and hydrocarbon, as well as maximum reaction rates for propylene, either as the sole hydrocarbon or as a component of the exhaust. The various dependent variables are presented as functions of the reactant concentrations by means of contour diagrams derived by computer treatment. The effect of "hydrocarbon" and NO levels on smog effects are discussed; the observed relationships between end effects and reaction rates are considered. The study simulated the effects of varying degrees of vehicular emissions control over one or both reactants and has a bearing on the establishment of vehicle emission standards in California. (Author)##

00362

H. I Schiff

KINETICS OF ATMOSPHERIC GASES (FINAL REPT.) McGill Univ., Montreal, Canada, Upper Atmosphere Chemistry Group (Rept. No. AFCRL-66-1). Nov. 1965. 44 pp.

Summaries are presented on work already published in the literature. These include kinetics of atom and excited molecule reactions, and recombinations; absolute quantum yield measurements; and diffusion coefficients. The following summarizes work yet to be published. The reaction of O atoms with aluminum vapor was found to produce chemiluminescent flows which consisted of a continuum, whose intensity distribution was similar to that obtained from rocket experiments. The reaction of O atoms with trimethyl aluminum (TMA) also produced a chemiluminescent continuum. No resonance radiation corresponding to A10 emission could be produced by irradiating the reaction products with continuum or discrete light sources. The reactions of a number of metalorganic compounds with active nitrogen produced glows which consisted of a number of bands, some of which have not yet been identified as well as lines from excited metal atoms. The rate of reaction of TMA with molecular oxygen was studied using the mass spectometric technique. The rate constant was found to be (2 plus or minus 0.3) x ten to the minus sixteenth power cubic centimeters per molecule per second. The rate of the reaction of TMA with atomic oxygen was found to be grater than could be measured with this technique and must therefore occur at close to collision frequency. (Author)##

00432

M. F. Morrison, R. G. Rinker, and W. H. Corcoran

RATE AND MECHANISM OF GAS-PHASE OXIDATION OF PARTS-PER-MILLION CONCENTRATIONS OF NITRIC OXIDE. Ind. Eng. Chem. Fundamentals 5(2):175-181, May 1966.

Rates of the air oxidation of parts-per-million concentrations of nitric oxide were studied homogeneously at atmospheric pressure and ambient temperatures in a constant-volume batch reactor. The initial concentration of nitric oxide was varied from 2 to 75 p.p.m., while the oxygen concentration ranged from 3 to 25 volume %. The initial order of the oxidation reaction in the absence of nitrogen dioxide was determined to be 2.00 plus or minus 0.09 for nitric oxide and 0.97 plus or minus 0.11 for oxygen. From initial rate data at 26.5 C., a third-order rate constant of (1.297) plus or minus 0.051) x 100,000 (104) liter 2-squared g. mole 2-squared sec. was obtained. The addition of nitrogen dioxide increased the initial oxidation rate, and that compound showed an auto-catalytic effect throughout the course of the reaction. A nonlinear least-squares analysis was used to develop a mechanism involving six reactions, with NO3, N2O3, and N2O5 as intermediates. Use of that mechanism gave a minimum standard deviation of 1.6 p.p.m. for the predicted concentrations of nitric oxide relative to the experimental data.##

00453

J.P. Detrie

(METHODS AND TECHNIQUES CARRIED OUT IN FRANCE IN THE FIGHT AGAINST ATMOSPHERIC POLLUTION.) Methodes et Moyens en Oeuvre en France pour Lutter contre la Pollution Atmospherique. Rev. Soc. Roy. Belge Ingrs. Ind. (Brussels) No. (5):207-217, May 1966. Text in French

Legislative proposals put into effect in the Paris region over the last five years are reviewed. There is a close liaison established between private organizations, representing the hygiene specialists and private industry and public powers. Studies carried out to determine the extent of pollution, that is, emission, dispersion, type of environment and its effect on pollution, demonstrated the problems involved with means of combating pollution. The solution cannot be found in generalized formulas which are too often recommended, and which mask the detailed effort necessary to obtain good carburetion and combustion of fuels and proper construction of buildings and equipment. (Author summary)##

00502

W. J. Hamming, W.G. MacBeth, R.L. Chass

THE PHOTOCHEMICAL AIR POLLUTION SYNDROME AS EXHIBITED BY THE ATTACK OF OCTOBER 1965. Arch. Environ. Health., 14(1):137-149, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., March 2-4, 1966.)

The photochemical air pollution syndrome which occurred on the days of October 26, 27, 28, 1965, was typical and it followed the pattern set by previous smog attacks. These factors are: (1) low wind speeds to concentrate the pollution in one area, (2) low inversion heights so that little vertical mixing can occur to dilute the emitted materials, (3) a trajectory which carries the emitted pollution to Los Angeles Civic Center and to Pasadena and Azusa or Burbank in the afternoon, and (4) sufficient sunlight to photodissociate the NO2 formed, and to form nitric oxide and atomic oxygen. The results are high oxidant or ozone and large quantities of sub-micron size particles. In addition, eye irritants and "plant damaging" chemicals are formed. Some of these are, it is believed, formaldehyde, acrolein, PAN, chemical free radicals, other nitrates or nitroso compounds, and a peroxyformyl activated complex. Authors present sixteen (16) charts and tables to substantiate the events in this air pollution episode. They include meterology, concentrations of various oxidants, pulmonary blow resistance, and variations in eye irritation.##

00618

E. A. Schuck, J. N. Pitts, Jr., J.K.S. Wan

RELATIONSHIPS BETWEEN CERTAIN METEORLOGICAL FACTORS AND PHOTOCHEMICAL SMOG. Intern. J. Air Water Pollution Vol. 10(10):689-711, Oct. 1966. (Presented at Photochemistry Symposium, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, Apr. 20-22, 1964.)

By a method of averaging, involving a large amount of atmospheric monitoring data, it has been shown that interesting and perhaps valid information on the formation and intensities of smog symptoms can be obtained. For example, it has been shown that the concentration of maximum daily oxidant is a function of day of the week and that this function might be related to automotive traffic patterns. Thus for certain time periods maximum daily oxidant was at a minimum on weekends at stations in the northern protion of the Los Iangeles Basin (Burbank, Pasadena, Azusa). During this same time period the maximum daily oxidant was found to be at a maximum on weekends near certain cities in the southern portion of the Basin (Inglewood, Long Beach). These two distinctly different weekend patterns correspond in part to the recreational activities of the populace, and in addition, indicate that mixing is less than complete in the Los Angeles Basin. In spite of this lack of complete mixing the macimum daily oxidant at stations within a 600 to 800 square mile area are directly proportional to each other in a predictable fashion. The weekend daily temperatures are also affected presumably by the same factors which influence the weekend oxidant intensity. Changes in inversion height and wind speed appear to account for twofold changes in macimum daily oxidant values. Maximum daily oxidant concentration was also found to be directly related to the square root of light intensity with little if any dependence on temperature. This study also indicates that pollution levels are proportional to each other over large areas of the Basin. The analysis of atmospheric data indicates that variable hydrocarbon to oxides of nitrogen rations do exist in the atmosphere and that there exists a dependence of atmospheric smog symptom intensity upon this ratio.##

00757

A.P. Altshuller J.J. Bufalini

PHOTOCHEMICAL ASPECTS OF AIR POLLUTION: A REVIEW.

Photochem. Photobiol., Vol. 4, 97-146, 1965.

Materials that are emitted in the atmosphere are subjected to a number of interesting and unusual reactions. These reactions lead to many products whose deleterious effects have now been recognized as one of the most pressing problems in urban areas throughout the world. These effects can be observed in reduced visibility, eye irritation, plant damage, cracking of rubber, and corrosion of metals. This paper is concerned with the present state of the problems in air pollution, with emphasis on recent literature. The chemical aspects are covered in some detail through 1963. The biological effects are surveyed more briefly, with literature reviewed up to the fall of 1963.##

00783

D.A. Lynn, B.J. Steigerwald, J.H. Ludwig

THE NOVEMBER-DECEMBER 1962 AIR POLLUTION EPISODE IN THE EASTERN UNITED STATES. Public Health Service, Cincinnati, Ohio, b8div. of Air Pollution. (999-AP-78) 1964. 28pp.

This report documents the subject "episode" with respect to meteorology, air quality, and public reaction. Particulate and gaseous air quality data are reported and discussed. Meteorology and public reaction are discussed with reference to the Public Health Service program of Air Pollution Potential Forecasts. Epidemiological aspects are not considered. (Author abstract)##

00851

MONTHLY REPORT OF METEOROLOGY, AIR POLLUTION EFFECTS AND CONTAMINANT MAXIMA (MARCH 1966 WITH OUTLOOK FOR MAY). Air Pollution Control District, Los Angeles, Calif., Technical Services Division. Mar. 1966, 15 pp.

Contains data for the Los Angeles County area for March 1966 on inversion base heights, mixing heights, average wind speed, precipitation, visibility, number of smog warning days, and a daily log of selected weather conditions. Six pages are devoted to daily maxima for carbon monoxide, nitrogen oxides, ozone, sulfur dioxide, and beta-radioactivity. Cumulative totals for selected meteorological and air pollution data through March are given plus average pollution and weather conditions for May (1950-1965); statement on the outlook for May 1966 is also provided.##

00929

CONTINUOUS AIR MONITORING PROGRAM IN CINCINNATI, 1962-1963. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution, (999-AP-21). Jan. 1965. 193 pp.

This report presents results of the operation of the Public Health Service Continuous Air Monitoring Program (CAMP) in Cincinnati, Ohio, during 1962 and 1963. Data on atmospheric levels of sulfur dioxide, nitric oxide, nitrogen dioxide, total oxidants, total hydrocarbons, and carbon monoxide are analyzed and discussed. The data are tabulated as hourly, daily, and monthly mean concentration. Background information about Cincinnati and descriptions of the instrumentation are included. (Author abstract)##

01027

R. J. Gordon

PHOTOCHEMICAL MEASUREMENTS OF ULTRAVIOLET SUNLIGHT. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-38.)

Measurements of solar ultraviolet radiation intensity were made, using two photochemical reactions. These were the gas-phase bag photolysis of NO2 in nitrogen and the photoisomerization of o-nitrobenzaldehyde in liquid solution. Results of the two methods were converted, as nearly as possible, to absolute light intensities. The two sets were compared and, as applied, it appears that the solution method is simpler and gives more consistent results. It should be noted, however, that atmosphere NO2 will affect the two methods to different degrees. A continuous recording actinometer based on the solution method was developed and gave satisfactory initial trial runs.##

01068

J.F. Clarke

A SIMPLE DIFFUSION MODEL FOR CALCULATING POINT CONCENTRATIONS FROM MULTIPLE SOURCES. J. Air Pollution Control Assoc. Vol. 14(9):347-352, Sept. 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

Four meteorological parameters were combined with Cincinnati's CAMP source-emission inventory data. Accepted diffusion coefficients and readily available meteorological data were utilized in a model simple enough to allow calculations without the aid of an electronic computer. Dispersion coefficients, effective stack height, wind direction and velocity, and depletion were considered. The results were considered to be within the precision of the source inventory. The model has application as a forecasting tool and as an aid to evaluating urban air pollution sources and explaining air quality measurements. It can be simply presented in diagrams of relative concentration (x/Q) and used with source strength data to obtain quick estimates of point concentrations from multiple sources. The variation of concentration due to variations of the meteorological and source parameters is readily obtainable. Application of the model to other locations requires only a change in the presentation of emission data. It is presumed that the model is adaptable to any location within Cincinnati, to other pollutants, and hopefully, to other cities.##

01244

J. J. Bufalini and J. C. Purcell

NITROGEN: FORMATION BY PHOTOOXIDATION OF ETHYLENE IN THE PRESENCE OF ITS OXIDES Science 150, (3700) 1161-2, Nov. 26, 1965.

The apparent lack of nitrogen balance for the photooxidation systems containing olefin and nitrogen oxides can be explained by evidence for the production of molecular nitrogen; molecular nitrogen was identified by gas chromatography and mass spectrometry. (Author abstract)##

01264

F. C. Alley, G. B. Martin, and W. H. Ponder

APPARENT RATE CONSTANTS AND ACTIVATION ENERGIES FOR THE PHOTOCHEMICAL DECOMPOSITION OF VARIOUS OLEFINS . J. Air Pollution Control Assoc. 15, (8) 348-50, Aug. 1965.

The photochemical reaction of various olefins and nitrogen dioxide was studied under conditions of controlled temperature, pressure, and humidity in a 200 liter stirred glass reactor. The hydrocarbon concentration in the reactor during four and five hour irradiation periods was monitored with a flame ionization chromatograph. Reaction rate constants, based on three consecutive first order reactions, were calculated for reactor temperature of 20, 25, 30, and 35 degrees centigrade. Activation energies for the three consecutive reactions were calculated from the Arrhenius equation. Branched and straight chain olefins were studied at initial concentrations of 5.0 to 10.0 parts per million. (Author abstract)##

01396

J.R. Hodkinson

CALCULATIONS OF COLOUR AND VISIBILITY IN URBAN ATMOSPHERES POLLUTED BY GASEOUS NO2. Intern. J. Air Water Pollution, Vol. 10:137-144, 1966.

Calculations are made of the optical effects of persistent gaseous NO2 pollution at 0.2-2 ppm in a city atmosphere in both the presence and absence of a polluting aerosol which does not absorb light or NO2. It is concluded that the colouring of the horizon sky and of distant white objects would resemble whisky, tea or cola-drinks, and the visual range would be markedly reduced. (Author abstract)##

01481

Nader, J. S. (ed.)

PILOT STUDY OF ULTRAVIOLET RADIATION IN LOS ANGELES, OCTOBER 1965. (A REPORT ON CONCURRENT MEASUREMENTS MADE BY COOPERATING ORGANIZATIONS BY VARIOUS METHODS.) Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-38, 91p., (Presented at the Fourth International Biometeorological Congress, Rutgers Univ., New Brunswick, N.J., Aug. 26 - Sept. 2, 1966.)

Measurements of 300-380-nm UV radiation in Los Angeles were conducted under varying conditions of smog environment, below and above the urban smog layer, and at various elevations through the smog atmosphere in October 1965. The UV energy incident on a horizontal plane surface detector near ground level at solar noon on a clear day (no smog) was 31 w/m square meter or 37% of the maximum possible for that date based on the value of 85 w/sq m of UV radiation entering the earth's atmosphere. Attenuation of UV radiation varied with smog intensity. Transmission through the atmosphere from 5700 feet (Mt. Wilson) to 350 feet (Laboratory rooftop) above sea level, average through the day, was 87% for a clear day and 65% for a moderate-to-heavy-smog day. Outgoing radiation was significantly increased by the smog environment. In heavy smog, values were higher by a factor of about 2 than those obtained in a no-smog environment. Outgoing radiation also tended to increase exponentially with elevation. UV scatter or transmission measurements appear to offer potential as a sensitive method of monitoring environmental smog levels as an alternative to visibility which is subjective and semiquantitative. The high scattering capability of a smog atmosphere points to the need of measurements of UV radiation in all directions, particularly as this applies to photochemical reactions in the atmosphere, and a correlation of such measurements with measurements of vertical components. (Author's summary)##

01504

W. J. Hamming and J. E. Dickinson

CONTROL OF PHOTOCHEMICAL SMOG BY ALTERATION OF INITIAL REACTANT RATIOS. J. Air Pollution Assoc., 16(6):317-323, June 1966.

A study of the variation in eye irritation with irradiation time demonstrates that the time at which eye irritation measurements are taken is important in understanding the entire photochemical mechanism underlying the smog problem in the summer in Los Angeles. The data analyzed were obtained from 5 experimental studies conducted under a variety of conditions. Analysis of the data from chamber irradiation experiments indicate that eye irritation is noted at the same time as the max. concentration of nitrogen dioxide. The chamber data have shown that the initial concentrations of the 2 principal reactant contaminants, hydrocarbons, oxides of nitrogen, and the relationship between them, must be considered in studying the production of eye irritation from photochemical smog. To determine how the initial reactant concentrations affect the degree of eye irritation which can be produced, the available data from several experimental studies were analyzed.##

01587

G.J. Doyle

MODEL AEROSOLS FOR ATMOSPHERIC SMOG. Stanford Research Inst., South Pasadena, Calif., Southern California. 1961. 18pp.

One model reaction for formation of aerosol in the atmosphere requires the presence of sulfur dioxide at fractions of a part per million in photoxidizing mixtures of olefin and nitrogen oxide at part per million concentrations. An experimental study of this type of reaction and the results to date are described, with particular emphasis on 2-methyl-2-butene as the olefin.##

01602

E.A. Schuck

THE NATURE OF EYE IRRITANTS IN SMOG. Stanford Research Inst., South Pasadena, South Pasadena, Southern California Labs. 1961. 8 pp.

Three ppm of individual hydrocarbons were mixed in pure air along with 1 ppm of nitric oxide or nitrogen dioxide. During the subsequent two hour irradiation with near-ultraviolet light the mixture was monitored with a long-path infrared spectrophotometer. The major products formed by photooxidizing many individual hydrocarbons were readily identified and their concentrations measured. In general, it was found that most olefins react rapidly and generate irritation while saturated hydrocarbons are relatively unreactive and do not result in irritating mixtures. In the absence of specific knowledge of the types and concentrations of the components of smog-producing atmospheres, control of olefins rather than oxides of nitrogen appears to be the more practical approach to control of eye irritation. The effect of control measures on eye irritation will be a function of several factors. Some of these factors are: the olefin-to-oxides of nitrogen concentration ratio; the type of olefin or olefin mixture involved; and the length of irradiation time and intensity of sunlight. To the extent that these auto exhaust mixtures are typical, it is concluded that ethylene and propylene are the most important precursors of eye irritation in such mixtures.##

01650

B. E. Saltzman , A. T. Coleman, and C. A. Clemons

HALOGENATED COMPOUNDS AS GASEOUS METEOROLOGICAL TRACERS: STABILITY AND ULTRASENSITIVE ANALYSIS BY GAS CHROMATOGRAPHY. Anal. Chem. 38, 753-8, May 1966.

Tracer compounds added to moving air masses are useful for demonstrating the transfer of pollutants from one local area or city to another. A study of gaseous compounds resulted in the selection of three suitable materials: sulfur hexafluoride, bromotrifluoromethane, and octafluorocyclobutane. These materials are non-toxic, are rare in the atmosphere, and can be readily dispersed from weighed tanks containing them in liquid form under pressure. An appropriate mixture can be employed if necessary to reduce possible errors caused by interfering emissions, and the components in air can be determined with high sensitivity in a single 10-minute run. An ultrasensitive gas chromatographic procedure with an electron-capture detector was developed which utilized carefully purified carrier gas and optimized columns, detectors, and operating parameters. Sensitivity of 10 to the minus five power ppm was achieved for sulfur hexafluoride without concentration of the sample. Convenient procedures for sampling and calibration were established. Reactivities of these materials with ordinary atmospheric pollutants such as automobile exhaust, hydrogen sulfide, nitrogen dioxide, ozone, and sulfur dioxide were studied at various humidities, both with and without irradiation equivalent to sunlight. Good stability was indicated. Losses by washout due to rainfall appeared to be negligible. These techniques should be very useful both for tracing local emissions and for long-range meteorological studies of movement of air masses. (Author abstract)##

01718

A. P. Altshuller and I. R. Cohen

PHOTO-OXIDATION OF ACROLEIN-NITROGEN OXIDE MIXTURES IN AIR. Intern. J. Air Water Pollution. 7, 1043-9, 1963.

The photolysis of acrolein and the photo-oxidation of acrolein in the presence of oxygen have been investigated at high concentrations of acrolein. Both reactions have been reported to proceed very slowly when the ultraviolet radiation used is in the solar region (less than 2900 A). The present study was made of acrolein-nitrogen oxide mixtures in the ppm range when photooxidation is initiated by solar type radiation. The acrolein was varied between 1 and 12 ppm and the nitrogen dioxide or nitric oxide between 0 and 50 ppm with the reactants diluted in one atmosphere of air. The results are of interest as related to photochemical reactions in the atmosphere. (Author abstract)##

01825

S. I. Kopczynski

PHOTO-OXIDATION OF ALKYLBENZENE-NITROGEN DIOXIDE MIXTURES IN AIR. Intern. J. Air Water Pollution. 8, 107-20, 1964.

Measurements of the relative reaction rates of various alkylbenzenes in photo-oxidative reactions with NO2 in the air are reported. The reaction rates are compared with the relative basicities of the compounds. A partial analysis of the gas phase and condensed phase products is also reported. It appears that as much as 50 per cent of the reacted carbon atoms may be contained in the condensed phase. The several irradiation and analytical techniques employed are compared. The photo-oxidation reactions of olefins and alkylbenzenes are compared. Free radical chains appear to play a more important role in the photo-oxidation reaction rates of certain alkylbenzenes than in the reaction rates of olefins. Hyperconjugative interaction of the methyl groups with the aromatic ring is proposed as a possible explanation of the order of reactivity of various isomers of the methylsubstituted benzenes. (Author abstract)##

01984

A. P. Altshuller and I. R. Cohen

STRUCTURAL EFFECTS ON THE RATE OF NITROGEN DIOXIDE FORMATION IN THE PHOTO-OXIDATION OF ORGANIC COMPOUND-NITRIC OXIDE MIXTURES IN AIR. Intern. J. Air Water Pollution, 7, 787-97, 1963.

The rapid conversion of nitric oxide to nitrogen dioxide occurs in the presence of certain organic species and of ultraviolet radiation below 4000 A. The reaction is an important and critical step in the over-all reactions of organic compound-nitric oxide photochemical systems. These systems in turn are an important part of the reaction complex associated with the photochemically initiated type of air pollution. The eye irritation and plant damage effects found in photo-chemical "smog" have been simulated by the irradiation of certain hydrocarbon-nitrogen oxide systems (Leighton, 1961). Until recently the available experimental data on the photochemically initiated conversion of nitric oxide to nitrogen dioxide has been restricted almost entirely to work on olefinic hydrocarbons including isobutene, trans-2-butene, and 1,3-butadiene (Leighton, 1961; Tuesday, 1961). Recently, preliminary work has been reported on other organic species including the aromatic hydrocarbons (Altshuller et al. 1962a). It was shown that a number of dimethyl and trimethylbenzenes participate in this reaction about as effectively as do the 1-alkenes and appreciably more rapidly than tehylene. In the present work this study is extended to additional aromatic hydrocarbons, aldehydes, ketones, paraffinic hydrocarbons, and alcohols. Analyses for oxidant concentrations have been made on some of the systems studied. Some data have been obtained on the formation of aliphatic aldehydes in the reactions of aromatic hydrocarbon-nitric oxide systems. (Author abstract)##

02344

G. B. Spindler.

OBSERVATIONS ON THE RELEASE OF NITRIC OXIDE IN THE E-REGION. PLANETARY SPACE SCI. 14, 53-64, 1966.
CFSTI AD 632867

Observations on four nitric oxide releases in the E-region are described. As a result of these observations, some changes are suggested in the current kinetic theory of the NO-O reaction, and a reaction model is presented. It is proposed that the NO-O reaction, at least at E-region pressures, is bimolecular, and, in line with the findings of other experimenters, that the effective rate constant there may be faster than the value obtained for this reaction in the laboratory. Relative atomic oxygen profiles for two different latitudes are presented as well as evidence for a latitude effect on the profiles. The atitude at which atmospheric flow changes from turbulent to laminar is also different at these two latitudes. It is probably that atomic oxygen concentration drops sharply below 80 km, but above the peak of the profile, concentration falls with a first decadis scale height of 14 km, in agreement with photochemical theory. Observations on the wind-distorted luminous trail show a relatively strong wind shear present in each case near 100 km. (Author abstract)##

02352

J.J. Bufalini A.P. Altshuller

SYNERGISTIC EFFECTS IN THE PHOTOOXIDATION OF MIXED HYDROCARBONS. Environ. Sci. Technol. 1, (2) 133-8, Feb. 1967.

Since there is considerable disagreement in the published values for rate constants for olefin-atomic oxygen and olefin-ozone reactions, the reality of the so-called excess rate has been questioned. If the excess rate is not real, then the rate of oxidation of a given olefin should depend only on light intensity and NO2 concentration. If a second olefin of different reactivity is added to a given olefin, then no effect other than the influence of different O-atom and ozone concentrations should be observed on the given olefin and the hypothesis that the principal mode of disappearance of olefins is due to O-atom and ozone reactions is correct. As a test of this hypothesis, 1-butene was irradiated at three light intensities with NO2, both alone and in the presence of trans-2-butene and 1,3,5-trimethylbenzene separately. Synergistic effects were observed that could not be explained by O-atom and ozone reacrions alone. (Author abstract)##

02476

E. R. Stephens.

REACTIONS OF OXYGEN ATOMS AND OZONE IN AIR POLLUTION. Intern. J. Air Water Pollution 10, 649-63, Oct. 1966 (Presented at the Symposium on Photochemical Aspects of Air Pollution, Cincinnati, Ohio, April 1965.)

The reactions of free oxygen atoms and ozone as they apply to air pollution and the factors which govern the oxygen atom and ozone concentrations are reviewed. The role played by reactions of oxygen atoms with oxides of nitrogen is discussed as it affects the determination of light intensity by photolysis of nitrogen dioxide. The realtionship of these inorganic reactions to the attack on

hydrocarbon molecules is discussed along with the various attempts which have been made to account for the rate of disappearance of hydrocarobon in terms of its reactions with oxygen atoms and ozone. Since most of these attempts have indicated that these two reactions fall short of accounting for the observed rate of reaction, it has been suggested that free radical attack may play a role. Some difficulties with this concept are pointed out. Experiments on the reaction of olefins with ozone have produced discordant results and are discussed. (Author abstract modified)#
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02777

A. P. Altshuller, I. R. Cohen, and T. C. Purcell

PHOTOOXIDATION OF HYDROCARBONS IN THE PRESENCE OF ALIPHATIC ALDEHYDES. Science 156 (3777), 937-9, (May 19, 1967). 1966.

A new group of gas-phase reactions has been shown to contribute to the photooxidation of hydrocarbons. The photooxidation of aliphatic aldehydes in the part-per-million range at wavelengths below 3400 A produces intermediates that react with olefinic and aromatic hydrocarbons. The reactions have been investigated with laboratory ultraviolet radiation sources and solar radiation. Although the reaction rates are slower than those associated with the corresponding nitrogen oxide induced photooxidations, the rates are significant in terms of the time scale of interest in urban atmospheric reactions. These results may cause modifications of current considerations of whether control of nitrogen oxides will effectively reduce photochemical air pollution. (Author abstract)##

03373

H. E. Landsberg, "Chairman."

CITY AIR - BETTER OR WORSE? Air Over Cities Symp., Cincinnati, Ohio, 1961. pp. 1-22.
HEW A 62-5

Human activity has caused considerable changes in local climates. These modifications in turn have affected the temperatures of the lowest layer of the atmosphere, the diurnal temperature range, the shape of the diurnal temperature curve, the local relative humidity, the local electric field, the patterns and amounts of precipitation, and the speed and direction of winds. These effects have probably only minor influence upon human wellbeing. Other changes, however, have potentially harmful effects. The most radical effect has been on atmospheric suspensions and admixtures. None of these changes have been beneficial. The growth of nearly all urban areas and industrial complexes has out-paced the engineering and legal efforts to minimize the nuisance and the possible dangers of contamination. Already the ill winds from one settlement can influence the next town downwind. The day of planning in terms of single communities is over, and whole regional patterns now must be viewed together. Knowledge of air quality and its effects on health is not yet adequate. n the interest of public hygiene an intense effort in biometeorological and medical research is required. (Author summary)##

03858

A. P. Altshuller, S. L. Kopczynski, W. A. Lonneman,
T. L. Becker, R. Slater

CHEMICAL ASPECTS OF THE PHOTOOXIDATION OF THE PROPYLENE--NITROGEN OXIDE SYSTEM. Environ. Sci. Technol., 1(11):899-914, Nov. 1967. 29 refs.

Although it is not possible to fully represent all of the diverse effects associated with photochemical air pollution by studies of a single hydrocarbon, propylene was chosen as a representative reactive hydrocarbon. The propylene-nitrogen oxide or propylene nitrogen oxide-sulfur dioxide system when irradiated reacts readily to produce oxidant, formaldehyde, acetaldehyde, carbon monoxide, peroxyacetyl nitrate (PAN), and methyl nitrate, along with light scattering, and causes ozone and PAN-type plant damage and eye irritation. Thus, all of the major "smog" manifestations are reproducible, but not necessarily at the intensities experienced in the ambient atmosphere. The chemical and physical measurements of the photooxidation of propylene-nitrogen oxide or of propylene nitrogen oxide-sulfur dioxide over a range of reactant concentrations, at several light intensity levels, and under static or dynamic flow conditions are reported. Biological indicator measurement s will be reported in another paper. (Authors' abstract, modified)##

04988

R. D. Cadle H. S. Johnston

CHEMICAL REACTIONS IN LOS ANGELES SMOG. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 28-34.

Chemical reactions in smog are either reactions between two or more man-introduced contaminants or between an impurity and the natural components of the atmosphere. This paper discusses (1) certain well-known reactions which must certainly occur, (2) experiments to determine the nature of other reactions expected to occur under conditions which exist in the Los Angeles atmosphere, and (3) speculations about some reactions which may occur. Several investigators have discussed certain types of reactions which possibly occur in smog. Haagen-Smit has suggested that reaction products of olefins with ozone and oxides of nitrogen in the presence of sunlight are responsible for some of the unpleasant properties of smog. Johnstone has discussed the oxidation of sulfur dioxide to sulfur trioxide in the atmosphere, which would result in the formation of a mist of sulfuric acid. Blacet has proposed several photochemical reactions which could contribute to the ozone content of smog; in particular, he considered photoactivation and photolysis of nitrogen dioxide, sulfur dioxide, and aldehydes.##

05055L

G. B. Spindler

RESULTS OF THE NITRIC OXIDE SEEDING PROGRAM. Canadian Armament Research and Development Establishment, Valcartier, Canada. Sept. 1965. 84 pp. (CARDE Technical Rept. No. 538/65.)

Observations on a series of nitric oxide releases in the E-Region are described. As a result of these observations, changes are suggested in the current kinetic theory of the NO - O reaction and a new reaction model is presented. It is proposed that the NO - O reaction, at least at E-Region pressures, is bimolecular and, in line with the findings of other experimenters, that the effective rate constant there may be faster than the value obtained for this reaction in the laboratory. Atomic oxygen profiles for two different latitudes are presented as well as evidence for a latitude effect on the profiles. The altitude at which atmospheric flow changes from turbulent to laminar is also different at these two latitudes. It is probable that atomic oxygen concentration drops sharply below 80 km, but above the peak of the profile, concentration falls with a first decadic scale height of 14 km, in agreement with photochemical theory. Observations on the wind-distorted luminous trail show a strong wind shear present in each case near 100 km. (Author abstract)##

05205

M. Nicolet

IONOSPHERIC PROCESSES AND NITRIC OXIDE. Pennsylvania State Univ., University Park, Dept. of Electrical Engineering (Scientific Rept. No. 228.) (Rept. No. AFCRL-64-948.) Dec. 20, 1964. 29 pp.

Analysis of ionic processes in the ionosphere leads to the conclusion that nitric oxide and its ion are produced by a reaction between nitrogen molecules and molecular oxygen ions. Such a process implies a substantial increase of NO in the E layer to a value greater than the photochemical concentration. In the lower D region, N plus 2 and O plus 2 ions produced by cosmic rays are transformed into NO plus ions. A quantitative estimate shows that these conclusions are consistent with observational data in the chemosphere and ionosphere and also suggests the explanation of the night airglow continuum. (Author abstract)##

05533

Altshuller, A. P., S. L. Kopczynski, W. Lonneman, and D. Wilson

PHOTOCHEMICAL REACTIVITIES OF EXHAUSTS FROM 1966 MODEL AUTOMOBILES EQUIPPED TO REDUCE HYDROCARBON EMISSIONS. J. Air Pollution Control Assoc., 17(11):734-737, Nov. 1967. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper 67-6.)

In the summer of 1966, some automobiles from the Cincinnati phase of the GSA study were used in an irradiation chamber study to evaluate the photochemical air pollution potential of representative models of equipped and unequipped automobiles.

Only one set of automobiles, the unequipped Chevelles, produced exhaust capable under irradiation of forming significant levels of oxidant and PAN. Neither the equipped Chevelles nor any of the Fords or Plymouths, whether equipped or unequipped, produced exhaust having the characteristics necessary to form oxidant or PAN upon irradiation. The eye irradiation level reported by the panel upon irradiation of exhaust from unequipped Chevelles was much higher than that produced by the irradiated exhausts from any of the other types of automobiles. Overall, there does appear to be some small improvement with respect to eye irritation in comparing equipped automobiles with unequipped automobiles. To a large extent, the improvement in the air pollution potential of exhausts from equipped Chevelles compared to the unequipped Chevelles can be attributed to the reduction in the hydrocarbon to nitrogen oxide ratio. The irradiated exhaust from equipped Chevelles, except for aldehyde levels, is about the same in photochemical air pollution potential as are the exhausts from unequipped Fords and Plymouths. Such irradiation chamber measurements are related to exhaust reactivities. Hydrocarbon reactivities can be obtained by direct measurement of reactive and nonreactive hydrocarbons in the automotive emissions.##

05575

G. P. Larson, J. R. Taylor, and W. J. Hamming

STUDIES OF POLLUTION LEVELS IN RELATION TO AIR MOVEMENT IN THE LOS ANGELES ATMOSPHERE. Proc. Natl. Air Pollution Symp., 3rd, Pasadena, Calif., 1955. pp. 33-42.

Samples were collected in dustfall jars from a large number of stations in the Los Angeles Basin. The results are plotted in tons per square mile for SO2, salt, total dustfall, and water insoluble solids. The results of a nitrogen dioxide survey are also plotted showing surface trajectories for air, cross sections, and area distribution. Subsequent to these studies, 50 wind stations were established throughout the basin making it possible to demonstrate the effects of two separate source areas on adjoining areas. To determine the variations that could occur during smoggy periods when one source area might influence the other, the variations in air flow trajectory were studied. CO, nitrogen oxides, and hydrocarbons were measured hourly at several locations in both areas. The oxidation of hydrocarbons to produce eye irritation was also studied. These investigations illustrated the importance of relating the air movement to the sources of pollution, in order to anticipate influences that may be effected in the surrounding areas.##

05683

Dmitriev, M. T.

SOME PHYSICAL AND CHEMICAL PROCESSES IN AIR CAUSED BY IONIZING RADIATION. Atmospheric and Oceanic Physics (English Transl.) 1 (3), 179-84 (Mar. 1965). Russ. (Tr.)

A study was made of the physical and chemical processes which are of geophysical interest. In order to simplify the presentation, only the data which bear on the components of air are given. Some physical and chemical process in air such as ionization, molecule dissociation, production of ozone, nitric oxides and carbon dioxide caused by ionizing radiation and in particular by nuclear processes, are analyzed. The data obtained can be used to evaluate the effeciency of different ionizing radiations in the atmosphere.

05817

E. R. Stephens

THE REACTIONS OF AUTO EXHAUST IN SUNLIGHT. Preprint. (Presented at a Session of the Conf. Air Pollution Research on "Atmospheric Reactions of Constituents of Motor Vehicle Exhaust," Los Angeles, Calif., Dec. 5, 1961.)

When auto exhaust is diluted with air and exposed to sunlight chemical changes take place which lead to a variety of noxious products. Among these are eye irritants, plant toxicants, and aerosols. These effects can also be observed when dilute mistures of hydrocarbons, nitrogen oxides, and sulfur dioxide with air are irradiated. A number of the noxious products have been identified. Ozone and a new series of compounds called the peroxyacyl nitrates (PAN) are the principal plant toxicants formed by this reaction. The various members of the PAN family are powerful eye irritants as are the formaldehyde and acrolein produced in this oxidation reaction. The formation of products such as PAN and alkyl nitrate indicates the presence of organic free radicals since these compounds most probably arise through the reactions of the appropriate radicals with nitrogen dioxide. The corresponding reactions with nitric oxide probably lead to its oxidation to nitrogen dioxide, a phenomena which is observed and which is required to account for the formation of ozone. (Author abstract)##

05818

E. R. Stephens, W. E. Scott, P. L. Hanst, and R. C. Doerr

RECENT DEVELOPMENTS IN THE STUDY OF THE ORGANIC CHEMISTRY OF THE ATMOSPHERE. Preprint. (Presented at a Session on Smoke and Fumes, 21st Midyear Meeting, ((American Petroleum Inst., Division of Refining, Montreal, Canada)), May 16, 1956.)

A long-path IR cell, with which it is possible to detect many compounds in the air at concentrations in the parts-per million range, is being used to study reactions of air pollutants. Field studies of the Los Angeles smog by other investigators have shown that photochemical reactions caused by sunlight play an important role in its development. In the laboratory it has been demonstrated that O3 is formed when mixtures of NO2 and an organic compound in air are irradiated with artificial sunlight. This paper presents the results of further studies on this and other reactions of air-pollution chemistry. IR analysis of the products of the photochemical reaction between NO2 and an organic compound frequently reveals, in addition to bands of known compounds, several unidentified absorption bands which apparently belong to a single compound produced in significant quantity.

Although this compound is unstable, moderately pure samples of it can be condensed if the reaction products are drawn through a cold trap. Physical and chemical properties of this condensate, referred to as compound X, are consistent with the belief that it is an acyl-nitrogen compound, but its structure is not unequivocally determined. The importance of compound X in an explanation of the chemistry of the atmosphere is stressed. O3 is formed when compound X is irradiated, with or without added gasoline. O3 formation is slower with added gasoline, perhaps because the olefins present in the gasoline react with some of the O3. O3 is also formed when nbutyl nitrite is photolyzed in O2. The rate of formation of O3 was only slightly changed when SO2 was present in an irradiated mixture of olefin and NO2. Since the SO2 disappeared very slowly, it was concluded that neither the O3, the free radicals, nor any peroxides which are formed will oxidize SO2 to SO3 at a significant rate. (Author abstract modified) ##

06043

M. Neiburger

METEOROLOGICAL ASPECTS OF OXIDATION TYPE AIR POLLUTION. (In: The Rossby Memorial Volume.) California Univ., Los Angeles, Dept. of Meteorology. 1959. pp. 158-69.

The replacement of coal by petroleum products as an energy source, instead of eliminating air pollution, has led to a new type of air pollution characterized by the presence of oxidizing substances, chiefly ozone, and the occurrence of eye irritation, damage to vegetation, and reduction to visibility. It has been shown that photochemical reactions involving hydrocarbons and nitrogen dioxide in concentrations of a few parts per million can produce all these manifestations. The photochemical reactions require the combination of (1) sources of reagents, (2) conditions which prevent their dispersal, and (3) adequate solar radiation. The tremendous concentrations of automobile traffic, the exhaust from which is estimated to contain 7 percent of the hydrocarbons put into the fuel tank, in all metropolitan centers in the U.S. constitute sources which are at least as large as industrial sources (refineries). However, only on the subtropical west coasts of continents do the meteorological conditions for accumulation of pollutants, namely persistent light winds and temperature inversions, occur consistently together with adequate solar radiation. The outstanding example of this combination is Los Angeles, California. Studies of the relationship of air trajectories to the smog manifestations in Los Angeles are presented. These studies demonstrate the contribution of automobile exhaust as a principal source. (Author's abstract) ##

06235

Goetz, A. Stoeber, W. and T. Kallai

SYNERGISTIC PROPERTIES OF AEROSOLS (FINAL PROGRESS REPT. JAN. 20, 1961-Nov. 15, 1961) California Inst. of Tech., Pasadena, 49 pp. Nov. 15, 1961.

The general subject of this Report is the interaction of air-borne particulates with gaseous trace components of the atmosphere which leads to their accumulation upon these nuclei and causes what is commonly called "aerosol formation". An understanding of these processes is important because this accumulation of irritating substances may produce their synergistic intensivation, and the growth of these particulates increases their capacity for diffuse light scattering and causes the well-known visibility restriction by smog-like aerosols. The studies reported center on the physical aspects of aerosol formation, particularly on those resulting from photochemical reactions between NO2 and olefinic hydrocarbons. Instrumentation and methods, especially developed for the synthetic production of such aerocolloid systems, are described in detail -- as well as the procedures resulting in the quantative size and mass distribution of such aerosols. Experiments of exploratory nature are discussed which demonstrate that such reaction products form temporary condensates on artifically introduced particulates whenever present during photoactivation.

06480

B. Turner, D. M. J. Compton, and J. W. McGowan

ELECTRONIC AND IONIC REACTIONS IN ATMOSPHERIC GASES (YEARLY TECHNICAL SUMMARY REPT. SEPT. 1, 1965-AUG. 31, 1966).
General Dynamics Corp., San Diego, Calif., General Atomic Div. 83 pp. (Nov. 14, 1966) (Rept. Nos. DASA-1863 and GA-7419.)
CFSTI, DDC: AD 643 093

The explosion of a nuclear device in the atmosphere results in a high degree of ionization in the surrounding atmosphere. Because the free electron concentration corresponding to this ionization largely controls the transmission of radar and radio waves, the manner and rate with which the free electron concentration decreases is under intensive investigation. The electrons are lost by recombination with ions and by attachment to neutrals; these processes have rates which may vary by several orders of magnitude, depending strongly upon the identity of the positive ion or the neutral species with which the electron combines. The cross sections for charge transfer in collisions between nitric oxide and atomic and molecular positive ions of oxygen and nitrogen have been measured in the energy range from 3 to 200 eV in a crossed beam experiment. A technique to determine the fractional concentration of the excited ions in an ion beam as a function of source electron energy has been developed. The determination is made approximately 20 micron seconds after formation of the ions, so that only long lived states remain in the beam. Basically, the method consists of attenuating the ion beam in a gas-filled chamber where, in general, the excited ion attenuation is different from the ground-state ion attenuation. The study was completed for the case of an O2+ ion beam, and only one excited state appeared to be important. (Author abstract)##

06604

K. W. Wilson

NITROGEN OXIDES AND PHOTOCHEMICAL SMOG FORMATION - A LITERATURE SURVEY. California Univ., Los Angeles, Dept. of

Engineering. (May 1962.) 20 pp. (Rept. No. 62-20.)

Considerable work has been done to elucidate the role of hydrocarbons in photochemical smog formation. In contrast, no concentrated effort has been made to study the details of the reactions of the nitrogen oxides. Using a summary, by Leighton, of all of the significant work to date on the chemistry of smog formation, the attention is focused on the nitrogen oxides. An attempt is made to learn about the conversion of nitric oxide to nitrogen dioxide, studying the role of hydrocarbons, photochemical characteristics and possible reaction paths of the reaction. Also questioned is the influence of non-hydrocarbons on the rate of oxidation. The reactions of nitrogen dioxide to form stable end products were studied. Included are the chemical structures of these end products and the mechanism involved in NO2 disappearance. Up to the present time, no experiments simulating smog formation have been performed in which all of the nitrogen oxides present initially could be accounted for in terms of final products which were identified and measured. This may indicate that unknown compounds are formed or merely the lack of precision in measurements. On the basis of the present evidence, it appears that nitric acid, alkyl nitrates and acyl and peracyl nitrates are the most probable reaction products.##

06632

A. Goetz and R. Pueschel

BASIC MECHANISMS OF PHOTOCHEMICAL AEROSOL FORMATION. Atmos. Environ. 1, 287-306 (1967).

A photochemical reactor was applied to studies of the effects of sulfur dioxide humidity, and order of mixing of reactants on the photochemical production of aerosol from 1-octene and nitrogen dioxide in air. The effects of all three parameters are complex but explainable from a few reasonable assumptions, the most important of which is probably that initial contact between the aerosol nuclei and the more polar reactants has a governing effect on the nature of the product. The experimental results presented are obviously still lacking in sufficient detail for formulation of an adequate description of the complex reaction patterns which lead to the formation of photochemical aerosols in the presence of SO2 under various humidity conditions. Nevertheless, the data definitely indicate that the presence of stable particulates is a dominant factor, not only as centers of accumulant formation, but also as loci for the concentration of reactant gas molecules (H2O, NOx, SO2) in their immediate environment. The subsequent photoactivation will thus be more efficient at these centers than in the free volume between them. The existence of such localized statistical "order states" appears to be the most likely interpretation for the effect of the contact sequence order between reactants and particles.##

06993

S. Millman, W. Tank, J. Pressman

STUDY OF PERTURBATIONS IN IMPORTANT UPPER ATMOSPHERIC CHEMICAL SYSTEMS. Geophysics Corp. of America, Bedford, Mass.

(Dec. 1962). 55 pp. (GCA Technical Rept. No. 62-5-G.) (Scientific Rept. No. 4.)

A fundamental preparation is presented for a later phase of machine computation of some of the basic photochemical systems of the upper atmosphere which may be perturbed by rocket pollution. The present knowledge of these systems and their equilibrium in the upper atmosphere is reviewed. The oxygen system, the hydrogen-oxygen system, the nitrogen-oxygen system and the carbon-oxygen system have been analyzed. Of these it is felt that only the latter is at present not suitable for machine computation. Some computations (hand) are presented for the hydrogen-oxygen system at extreme altitudes where atomic hydrogen dominates and also some calculations have been performed with improved rate constants for the nitrogen-oxygen system.**

06994

S. Millman, G. Pressman, P. Warneck

OZONOSPHERIC MODIFICATION BY MISSILE EXHAUST. Geophysics Corp. of America, Bedford, Mass. (GCA Technical Rept. No. 62-14-G. Scientific Rept. No. 9.) 65 pp. (Dec. 1962).

A possible consequence of the increased launching of large rocket missiles is the large-scale local or worldwide modification of the atmosphere, in particular the occurrence of perturbations that might disturb the existing equilibria by causing chain, cyclic, or catalytic processes. This report considers these possible missile exhaust chemically induced changes in the ozonosphere, the lower reactive portion of the atmosphere. The possibility of chain, cyclic or catalytic processes initiated by one of the components in a rocket's exhaust trail that might cause appreciable changes in the composition of the atmosphere is studied. Chain, cyclic, and catalytic type processes are of greatest interest since destruction (or creation) of ozone on the basis of 1 molecule of ozone per molecule of initiating material would require immense amounts of material released into the atmosphere. In particular, possible reactions that occur when large quantities of OH or H radicals are uniformly released into the atmosphere at a height of 30 kms from hydrocarbon - lox systems are considered. Suggestions for experimental work are made in order that some of the preliminary estimates may be rendered less tentative. The results obtained indicated that large scale perturbations of the ozonosphere are possible under certain circumstances.**

06995

R. L. Miller F. H. Miller

DIFFUSION FORECASTING FOR TITAN II OPERATIONS. Air Weather Service, Scott AFB, Ill. (Rept. No. AWSTR 176.) (Feb. 10, 1964). 38 pp.

Information and procedures are provided for use as a basis for answering questions and giving advice concerning the atmospheric diffusion of TITAN II propellants. The Meteorology Laboratory, AFCRL, designed and installed a micrometeorological observing system at each of the 54 TITAN II complexes located near Davis-Monthan AFB, Arizona; Little Rock AFB, Arkansas; and McConnell AFB, Kansas. The TITAN II complexes are located in groups of 18 within a radius of approximately 60 miles from each of the three Air Force bases. The system is designed to provide the meteorological parameters necessary for evaluating the diffusive power of the lowest layers of the atmosphere at each complex. AFCRL developed techniques and procedures which would be used by Air Weather Service forecasters to provide diffusion forecast support to the operational TITAN II Squadrons. The information includes tables and graphs based on a new improved prediction equation which was developed at AFCRL using combined Dry Gulch, Ocean Breeze, and Prairie Grass data.##

07980

Griggs, M.

ATMOSPHERIC OZONE. In: A. E. S. Green, (ed.), The Middle Ultraviolet: Its Science and Technology, New York, John Wiley & Sons, 1966, Chapt, 4, p. 83-117. 86 refs.

A review of atmospheric ozone is presented. Optical properties of ozone, photochemical theory of atmospheric ozone, methods of measuring atmospheric ozone, observed characteristics of atmospheric ozone, further considerations of atmospheric ozone and effects of solar heating and cooling on the radioactive equilibrium temperature structure of the earth are discussed.##

08330

Jaffe, L. S.

PHOTOCHEMICAL AIR POLLUTANTS AND THEIR EFFECTS ON MEN AND ANIMALS. I. GENERAL CHARACTERISTICS AND COMMUNITY CONCENTRATIONS. Arch. Environ. Health, Vol. 15, p. 782-791, Dec. 1967. 88 refs.

The physical and chemical characteristics of photochemical smog and the photochemical oxidants are described. Aerometric data on the "total oxidant" concentrations found in the large urban communities affiliated with the Public Health Service, Continuous Air Monitoring Program (CAMP) network are documented for 1964 and 1965. Similarly, the number of days on which the "total oxidant" concentrations equalled or exceeded 0.05, 0.1, and 0.15 ppm, respectively, has been delineated for each of the affiliated cities in this network. The 0.05 ppm and 0.1 ppm levels are routinely found and are exceeded in all of the cities affiliated with this network for highly significant percentages of days of the year, while the 0.15 ppm level is exceeded only in Los Angeles thus far for a significant percentage of the total number of days of the year. However, much higher maximum hourly and maximum five-minute levels are attained in all of the cities (but one) during the year. (Author's summary, modified)##

08805

Knauer, A.

ABOUT THE RELATIONSHIP BETWEEN AIR POLLUTION AND SELECTED METEOROLOGICAL MEASUREMENTS - PRESENTED AS AN EXAMPLE MEASUREMENT SERIES OF SO2 AND NO2 OVER A PERIOD OF SEVERAL YEARS. ((Ueber Beziehungen zwischen Luftverunreinigung and ausgewahlten meteorologischen Messgrossen - dargestellt am Beispiel mehrjahriger SO2 und NO2-Messreihen.)) Text in German. Z. Ges. Hyg. Ihre Grenzebiete (Berlin), 13(7):473-476, July 1967.

A sulfur dioxide pollution measurement series of 40 months duration (about 7,500 individual measurements) and nitrogen dioxide measuring series of 31 months duration (about 6,000 individual measurements) were evaluated. The measurements were taken hourly between March 1963 and June 1966 (NO2 from December 1963) during all workdays from 8:00 a.m. to 4:00 p.m. at the Hygiene-Institute of the Humboldt University. The minimum and maximum of the monthly mean values for SO2 and NO2 occur at approximately the same times and are repeated in a yearly rhythm. The maximum of pollution invariably coincides with the minimum of air temperature and vice versa. The air-hygienic exposure conditions and the frequency with which the hygienically admissible limit is exceeded are described. During heating periods SO2 rates exceed the limit by an average of 17.2%, while during nonheating periods the average exceeding value is 1.7%. NO2 emissions never exceeded the hygienically admissible limit value. The proportion of the monthly mean value for NO2 and SO2 also changed periodically. Low values of horizontal wind velocity and low air temperatures increased the SO2 emission values. The least favorable air hygienic hygienic conditions were recorded during heating periods, when the wind velocity was below 3 Bft. (8-12 mph) and the air temperature below or at + or - 0 deg C. The SO2 emissions exceeded the admissible limit by an average of 45% under these conditions. (Author's abstract, modified)##

09430

Liberti, Arnaldo and Giuseppe Devitofrancesco

EVALUATION OF SULPHUR COMPOUNDS IN ATMOSPHERIC DUST. In: Air Pollution. Proceedings of the Symposium on the Physico-chemical Transormation of Sulphur Compounds in the Atmosphere and the Formation of Acid Smogs. Organisation for Economic Co-operation and Development, Paris Directorate for Scientific Affairs, Paper 6, Dec. 1967, p. 47-51.

Extensive research on the physical constitution and chemical composition of atmospheric dust and physico-chemical transformation of sulphur compounds is discussed. Surface area was determined for dust collected in various Italian cities by using a gas adsorption technique. The surface area was found to be about

6.2 sq. m./g. Volatile compounds were analysed by infrared spectroscopy. CO_2, CO, CH_4, NH_3, N_2O, nitro-compounds, and ethylene were detected. Sulphur content of atmospheric dust was determined by combustion and the sulphate by extraction with dilute mineral acid. No detectable amount of sulphur dioxide and of free acidity was found.##

10018

Fensterstock, Jack C. and Robert K. Fankhauser

THANKSGIVING 1966 AIR POLLUTION EPISODE IN THE EASTERN UNITED STATES. Public Health Serivce, Durham, N.C., National Center for Air Pollution Control, Publication N/. AP-45, 45p, July 1968. 12 refs.

The Thanksgiving 1966 Air Pollution Episode in the Eastern United States is documented in terms of daily meteorology and ambient air quality. Analysis of the available air quality data indicates that the Air Pollution Potential Forecast Program (APFP) of the Public Health Service and Weather Bureau did forecast the stagnation. Meteorological data for selected cities were based on the diurnal average tenperature, cloud cover, afternoon mixing depths, average wind speed through mixing depth, ventilation, resultant wind direction and the average surface wind speed. Air quality measurements on the gaseous pollutants sulfur dioxide, oxides of nitrogen, hydrocarbon and carbon monoxide were made daily. Suspende and settling particulate of solids and liquids were also measured diurnally. The high level of air pollution in the eastern U. S. during the period Nov. 24 through 30, 1966, created adverse health effects. Researchers in New York City found an increase in the death rate of approximately 24 deaths per day during the period.

10504

Public Health Wervice, Cincinnati, Ohio, National Center for Air Pollution Control

IRONTON, OHIO - ASHLAND, KENTUCKY - HUNTINGTON, WEST VIRGINIA AIR POLLUTION ABATEMENT ACTIVITY. PRE-CONFERENCE INVESTIGATIONS. (TECHNICAL REPORT.) 85p., May 1968 8 refs.

An extensive area survey of air pollution was conducted in the Ironton, Ohio; Ashland, Kentucky; Huntington, West Virginia region for the period of September 1965 to August 1967. The following topics are discussed: topography; climate; materials deterioration; industrial, municipal, and private emission sources; geographic distribution of pollutants; and measurement methods and locations. The pollutants of interest were particulates, NO_x, SO_x, and H_2S. An emission inventory is included, along with discussions of some of th major pollution sources.

10682

Hamilton, Harry L., Jr., James J. B. Worth and Luman A. Ripperton

AN ATMOSPHERIC PHYSICS AND CHEMISTRY STUDY ON PIKES PEAK IN

SUPPORT OF PULMONARY EDEMA RESEARCH. Research Triangle Inst., Durham, N. C., Contract DA-HC19-68-C-00298, 54., May 1968. 10 refs.
CFSTI, DDC: AD 680989

Measurements of atmospheric trace gases on the summit of Pikes Peak (14,110 ft) from late July through mid-October 1967 were made in support of pulmonary edema research. Suporting meteorological data were also collected. Local intermittent contamination by combustion products afforded an opportunity to examine conditions corresponding to those which might be experienced by troops in encampments. Concentrations of ozone (O3), in uncontaminated air showed a maximum at night and a minimum during the daytime. The daytime minimum is attributed to mixing of the air from the altitude of the peak with ozone-depleted air from near ground level in adjacent valleys and plains. In contaminated air, ozone concentration on the average showed no maximum, and mean values for each hour were considerably lower than in uncontaminated air. This reduction results from destruction of ozone by NO from combustion products; measured concentrations of NO appear adequate to account for the decrease in ozone. Auxiliary stations for ozone measurement on the mountainside (10,840 ft) and at the base of the mountain (7,780 ft) showed the daytime maximum and nighttime minimum normally experienced in the lowlands. The station at 10,840 ft showed consistently higher ozone concentrations than did the valley station, with daytime values approaching the maximum (nighttime) values recorded on the summit; no explanation can be offered for this anomaly. A trend from high concentrations of ozone in July to lower concentration in October is apparent, conforming with the normal pattern of tropospheric ozone. A dampening of the diurnal wave patter of ozone concentrations is evident as the average concentration decreases. (Authors' abstract)##

11224

Went, F. W.

ON THE NATURE OF AITKEN CONDENSATION NUCLEI. Tellus (Uppsala) 18(2):549-556, 1966. 7 refs.

The number of Aitken condensation nuclei in the air is strongly influenced by human activities which increase the natural number manifold through release of combustion products from fires and combustion engines. The natural condensation nuclei near ground level increase during day decrease during night; there is a general decrease with increasing altitude in the atmosphere. These natural Aitken nuclei are produced in light from volatile products released by the vegetation (mainly terpenes) and therefore are organic macromolecules. They disappear again mainly by agglomeration, or near the inversion layer, and are then removed by precipitation. (Author's abstract)##

11225

Hilst, Glenn R.

AN AIR POLLUTION MODEL OF CONNECTICUT. Preprint, Travelers Research Center, Inc., Hartford, Conn., 33p., 1967.

(Presented at the IBM Scientific Computing Symposium, Yorktown, Hgts, N. Y., Oct. 24, 1967.)

A working air pollution simulation model for the State of Connecticut is presented. The model is capable of simulating air pollution concentration patterns for conservative pollutants within the State of an hour-by-hour basis, given the time and space variability of the sources of that pollutant within the State, the flux of that pollutant across the State border (also a time and space variable), and the time and space variability of atmospheric flow and diffusion patterns within the State. Reduced to its bare essentials, the problem of predicting air pollution concentrations in any arbitrary volume of the atmosphere requires specification of the following factors: (1) The immediate past trajectory of that volume of air - where has it been? (2) The emissions of pollutant at each locality over which the air has passed during the time of passage - how much pollution has been injected into the volume? (3) The lateral and vertical mixing of pollutants between this volume and adjacent volumes-how much has each incremental input of pollutant been diluted with air or other pollutants during its time of flight? (4) The loss or alteration of the pollutant by chemical reaction, deposition, sorption processes-how much of each incremental input of pollutant has been altered or lost during its time of flight? The Connecticut model structures the first three of these factors.##

12632

J. J. Kelley, Jr.

INVESTIGATIONS OF ATMOSPHERIC TRACE GASES AND SUSPENDED PARTICULATE MATTER ON MOUNT OLYMPUS, WASHINGTON. J. Geophys. Res. 74 (2), 435-43 (Jan. 15, 1969). 11 Ref.

Atmospheric CO2, water vapor, net oxidant, and suspended particulate matter were measured at the Blue glacier field station, Mount Olympus, Washington, during the summer of 1966. Diurnal variations of CO2, net oxidant, and water vapor are related to mountain and valley wind transport. Diurnal variations of CO2 and net oxidant have a phase nearly opposite to the typical diurnal variations in the rural lowlands. Concentrations of suspended particulate matter are lower than the concentrations of the urban and industrial areas of the Puget Sound region but generally follow the fluctuations of lowland concentrations. (Author's Abstract)##

14019

Altshuller, A. P.

COMPOSITION AND REACTIONS OF POLLUTANTS IN COMMUNITY ATMOSPHERES. Bull. World Health Organ. (Geneva), 40(4):616-623, 1969. 26 refs.

Data are presented showing the composition of gaseous and particulate substances in community atmospheres, based on measurements in various cities in the United States. Many of the pollutants react further, usually to produce substances as undesirable as the original ones, or more so; most of these reactions involve thermal oxidation or photooxidation. Because of the importance of considering air pollution on a regional or even continental scale, a general framework of residence times of pollutants is postulated: up to several days under adverse conditions in many regions, but less than 24 hours across large urban areas under more usual conditions of wind speed and movements of weather fronts. Pollutants and other atmospheric substances are categorized as either reactants-those substances emitted directly into the atmosphere from combustion, industrial, and biosphere processes; or products such as nitrogen dioxide and sulfates. Some substances may fall into both groupings. Data are given on rates of various reactions, and the nature of the products is described. In general, the measurements showed 1% to 15% conversions of gaseous to particulate species on a long-term basis; rates of conversion of nitrogen dioxide to nitrate were consistently lower than those of sulfur dioxide to sulfate. Recent work on particle size distributions of various metallic and non-metallic ions in particulates in U. S. cities is reviewed, with data given in terms of mass median diameters. It is pointed out that the biosphere is a source of, as well as a sink for, pollutants, and that urban levels of methane or nitrous oxide, for example, reflect to a considerable extent biosphere, rather than urban, emissions. Reactions originating in biosphere processes may contribute significantly to regional pollution, particularly during periods of stagnation. The need for increased emphasis on atmospheric investigations, as opposed to laboratory work, and for improved sensitivity and specificity in monitoring and sampling is discussed.

15308

Bockian, A. H., Frank Bonamassa, Herbert Faigin, and Herman Pinsky

USE OF THE INTEGRATING NEPHELOMETER TO MEASURE AEROSOL FORMATION FROM HYDROCARBONS. Preprint, California Air Resources Board, Los Angeles, 9p., 1969. (Presented at the Am. Chem. Soc., 158th Natl. Meet., New York, 1969.)

A recently-designed integrating nephelometer was used in environmental chamber experiments to measure light scattering resulting from the irradiation of different hydrocarbons in the presence of nitric oxide at ppm levels. In some of the experiments, 2 ml of gasoline were used; in others, several individual alkene and aromatic components of gasoline, in concentrations of 2 ppm each, were irradiated separately in the presence of 0.4 ppm nitric oxide for about 5 hrs. Six ppm of some alkanes found in gasoline were also allowed to react individually with 0.4 ppm NO. Several other experiments were performed in which the hydrocarbon was allowed to react with ozone in the dark. Agreement in the amount of light scattering between duplicate runs was excellent. In several cases, large amounts of aerosol were produced while the net oxidant concentrations were at a fairly low level. It was shown that some short-chain olefins, which may be very reactive in producing oxidant and eye irritation, produced little or no aerosol; in contrast, many paraffins which were found to be non-reactive in eye irritation studies produced aerosol. A great many aerosol producers contain seven or more carbon atoms and do not seem to be restricted to any class of hydrocarbon; a possible synergistic action between a short-chain high oxidant producer and a large molecule which produces aerosol remains to be investigated. The agreement between nephelometer readings and visual measurements of visibility was excellent.

15661

Friend, James P. and Robert J. Charlson

DOUBLE TRACER TECHNIQUES FOR STUDYING AIR POLLUTION. Environ. Sci Technol., 3(11):1181-1182, Nov. 1969. 8 refs.

Traditional models for predicting the diffusion and transport of pollutants from sources assume that the pollutant or tracer is conserved. These models are appropriate only for materials which are sufficiently inert or long-lived. Real air pollution problems involve materials which are both reactive and relatively inert. Examples of this are nitrogen oxide and carbon monoxide from automobile exhaust, or sulfur dioxide and carbon dioxide from burning of fossil fuels. Study of these double tracer systems is warranted because the reactive materials exist in actual urban atmospheres and because situations can be found where a single case of sources of each pair is dominant, e.g., virtually all NOx and CO come from automobiles in cities such as Los Angeles, and a relationship between the concentrations at the source has been shown to exist. Similarly, CO2 might be related to SO2 in New York. In these cases, CO and CO2 are assumed to be conserved, while NOx and SO2 may be removed by either atmospheric reactions or interactions with surface materials. Simultaneous observation of the reactive and conserved species from a single class of sources will permit the determination of the importance of removal by chemical reaction relative to meteorological processes. It should provide information concerning the importance of chemical sinks for reactive materials in the planetary boundary layer.

15729

Kozyrev, B. P. and V. A. Bazhenov

THE ROLE OF N2O, CH4 AND CO IN ATMOSPHERIC ABSORPTION IN THE INFRARED. (Rol' malykh atmosfernykh primesey v pogloshchenii infrakrasnoy radiatsii). Text in Russian. Fiz. Atm. i Okeana (Moscow), 5(7):738-744, 1969. 8 refs.

The transparency of minor atmospheric impurities is interpreted in the form of a function of the mass of absorbing gas divided by the equivalent mass of gas needed for 50% absorption at a given wavelength. This function fits available data with a scatter of not more than 8%. When taking into account, the non-uniformity of the atmosphere by the effective mass method, the selection of the fitting parameter (n) may lead to significant error in calculating transparency (T). If the average radiation absorption (A) at the center of the nitrous oxide methane and carbon monoxide and bands varies from 10-90%, then (n) may be selected so that the maximum absolute error in calculating transmission will not exceed plus or minus 14%. Taking into account the variability of (n) with the mass of the gas and the pressure reduces the error in calculating the transparency of minor components to plus or minus 5-7%. Calculating the transparency of various air masses in the centers of N2O, CH4 and CO absorption bands indicates the significant role of minor atmospheric components in the attenuation of infrared radiation.

MEASUREMENT METHODS

00051

J. S. Nader E. C. Tsivoclou (Co-Chairmen)

SYMPOSIUM - ENVIRONMENTAL MEASUREMENTS - VALID DATA AND LOGICAL INTERPRETATION. Public Health Service. Cincinnati, Ohio, Div. of Air Pollution and Div. of Water Supply and Pollution Control. July 1964. 332 pp.
GPO: 814-105-12, HEW: 999-AP-15

This collection of papers on air and water environmental measurements contains material pertaining to the data acquisition fields of air pplluticn. The systems operated by the Los Angeles County Air Pollution Control District and the U.S. Public Health Swrvice (Continuous Air Monitoring Program) are reviewed. Other articles connected with air and air pollution information include those on data acquisition systems for fields of meteorology, physiology, and data interpretation.##

00059

R.A. Young

MEASUREMENT OF NITRIC OXIDE IN THE EARTH'S ATMOSPHERE (INTERIM REPT.). Stanford Research Inst., Menlo Park, Calif. Jan. 31, 1965, 32p.
CFSTI,DDC: AD 622371

The objectives of this investigation were to develop a testing facility capable of evaluating an NO measuring device, and to develop the components of the device to a degree adequate for D-region measurement. During the past year, a D-region simulator has been constructed for the purpose of testing both laboratory models and prototypes of the NO detector with special emphasis on the assessment of possible interference by excited states of O2, N2, and NO. Although only limited testing has been possible, the concept of selectively measuring NO by photoionization appears sound. The D-region simulator and current activities are described.##

00068

M.W. Korth

DYNAMIC IRRADIATION CHAMBER TESTS OF AUTOMOTIVE EXHAUST. Public Health Service, Cincinnati, Ohio, Division of Air Pollution, PHS-999-AP-5. Nov. 1963, 59p.

A dynamic irradiation chamber facility was designed and built for investigations of irradiated auto exhaust under conditions of continuous mixing. The facility consists of a programmed chassis dynamometer, an exhaust dilution system, a dilution-air purification system, two irradiation chambers, and various exposure facilities. Three variables were considered in this first series of tests: (1) initial exhaust concentration (approximately 13 ppm carbon and 35 ppm carbon), (2) average irradiation time (85 and 120 minutes), and (3) fuel composition (14% and 23% olefins). The effects of varying these test parameters were determined by use of appropriate test criteria including NO2 formation rate, oxidant production, total hydrocarbon losses and reaction of specific species, aldehyde production, plant damage, and bacteria kill. Of the three variables studies, the exhaust concentration at the start of irradiation appeared to produce the most significant effects. Fuel composition had a lesser influence on some of the test criteria; vdry little difference was noted in the effects produced at the two average irradiation times. (Author)##

00092

M. Drexler M. Barchas

CHEMO-ELECTRICAL SENSING DEVICE. Airkem, Inc., New York City, June 1961, 142p.
CFSTI, DDC: AD 262502

This report describes an investigation of the feasibility of utilizing gas adsorption phenomena for the identification and quantitative determination of various gaseous materials. A discussion is presented of the factors influencing the performance of the various components of an experimental gas analyzer based on the measurement of characteristic adsorption energies. Reasons are given for the attempted use of this principle in such an instrument together with a theoretical discussion of the basis for concluding the instrument to be non-feasible in practice within the limitations of the original specifications. A review of material obtained from available literature sources as well as informa<ion resulting from experimental work is included in this report. (Author)##

00142

R. G. Hinners, J. K. Burkart, and G. L. Contner

ANIMAL EXPOSURE CHAMBERS IN AIR POLLUTION STUDIES. Preprint. 1966.

Recent developments in animal exposure chambers and their use in studying the biological effects of air pollution are described. The various atmospheres studied include irradiated and non-irradiated auto exhaust atmospheres, oxides of sulfur, and oxides of nitrogen. (Author)##

00144

G. B. Morgan, E. C. Tabor, C. Golden, and H. Clements

AUTOMATED LABORATORY PROCEDURES FOR THE ANALYSIS OF AIR POLLUTANTS. Preprint. 1966.

Automated methods are presented for the analysis of various components present in collected particulates, impinged gases and precipitation. Among these components are sulfates, nitrates, nitrites, ammonia, sulfur dioxide, chlorides and nitrogen dioxide. Adoption of automation has resulted in an increased precision for all of the aforementioned analyses. In addition, the productivity per man day is tripled to quadrupled over the corresponding manual procedures. Operational problems associated with the operation of the systems are discussed. (Author)##

00155

Sweeney, M. Patrick and Miles L. Brubacher

EXHAUST HYDROCARBONS MEASUREMENT FOR TUNEUP DIAGNOSIS? In: Vehicle Emissions, Part II, SAE Progress in Technology Series Vol. 12, New York, Society of Automotive Engineers, Inc., 1966, p. 307-316. 5 refs. (Presented at the SAE Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966.)

With an activated control program in California and its imminent prospect nationwide, recently attention has been focused on simplifying exhaust hydrocarbon measurement for potential use as a tuneup garage diagnostic tool. Work has been underway to evaluate new instrumentation and procedures for hydrocarbon measurement suitable for field use. It is concluded that: (1) With a "one minute" cycle, measured emissions seem to correlate adequately with the California procedure; (2) There are prototype instruments which are inherently much less susceptible to environment of use; and (3) For engine diagnostic purposes, the principal uses of hydrocarbon measurements would be: (a) an initial check (almost any engine malfunction raises hydrocarbons, if low, engine does not need tuneup work); and (b) recheck after tuneup (an increase in hydrocarbons indicates a tuneup oversight or error, and the car would then be checked further). (Authors' abstract)##

00192

S. Hochheiser and W. F. Ludmann

FIELD COMPARISON OF METHODS OF DETERMINING ATMOSPHERIC NO AND NO2. Preprint. (Presented at the 150th National Meeting, American Chemical Society, Atlantic City, N.J., Sept. 13, 1965.)

Atmospheric samples from several cities were used in a comparison study of the Saltzman and Jacobs-Hochheiser methods for measuring NO2 concentrations in the atmosphere. NO is determined by these methods after wet oxidation of the NO to NO2 in a gas scrubber containing acid-permanganate reagent. The methods were compared using samples collected for 30 minutes and 24 hours. Adsorbing reagents used in the 24-hour sampling methods were modified to accomodate circumstances associated with longer sampling periods. The relationship between atmospheric NO and NO_2 concentration and method of measurement is discussed. (Author)##

00214

T. R. Hauser and D. W. Bradley

THE SPECIFIC SPECTROPHOTOMETRIC DETERMINATION OF OZONE IN THE ATMOSPHERE USING 1,2-DI-(4-PYRIDYL) ETHYLENE. Anal. Chem. 38, 1529-32, Oct. 1966.

A new method for the sampling and analysis of ozone in the atmosphere is described. Atmospheric ozone is collected in a solution of 1,2-di-(4-pyridyl) ethylene in glacial acetic acid. The ollected ozone reacts with the 1,2-di(4-pyridyl) ethylene to form an ozonide that undergoes cleavage to yield pyridine-4-aldehyde for which a simple spectrophotometric determination was developed. The relationship between the micrograms of pyridine-4-aldehyde generated per microgram of ozone sampled has been determined, so that pyridine-4-aldehyde may be used for calibration. Various other oxidizing or reducing substances do not interfere with the method, at least not in the concentrations in which they are found in the atmosphere. The method offers good sensitivity, reproducibility, and excellent stability for delayed analysis after sampling. (Authors' abstract)##

00224

M. Shepherd, S. M. Rock, R. Howard, and J. Stormes

ISOLATION, IDENTIFICATION, AND ESTIMATION OF GASEOUS POLLUTANTS OF AIR. Anal. Chem. 23(10):1431-1440, Oct. 1951.

Previous attempts to concentrate air pollutants in a cold trap and analyze the concentrates by mass spectrometer have had disappointing results. A new method by which the air of Los Angeles County has been examined combines the isolation of gaseous pollutants on a filter at liquid oxygen temperatures, separation of the isolated frozen concentrate by isothermal distillation or sublimation at low temperatures and pressures, and identification and estimation of distillates by the mass spectrometer. The method is capable of determining as littla as 0.0001 ppm of some pollutants from a 100-liter sample of air; with larger samples, 0.000001 ppm of some substances can be determined. The gaseous phase of the Los Angeles smog was found to be of the order of 0.5 ppm of the air. About 60 chemcial compounds or families of compounds were identified or tentatively identified, and the amounts of some of these were determined. It was shown that the gaseous phase of the smog was primarily a mixture of hydrocarbons, and of hydrocarbons combined with O, N, and Cl. These hydrocarbons, principally the unsaturated ones, when oxidized with O_3 and NO_2 in the presence of UV light, produce substances which constitute a large proportion of the smog concentrates. These oxidation products cause eye and respiratory irritations such as are produced by the real smog, and smell like spectra of the smog concentrates may eventually indicate the presence of other irritants. The new method may be applied to special problems in air pollution over large areas or inside industrial plants. (Authors' abstract)##

00297

G. B. Morgan, C. Golden, and E. C. Tabor

NEW AND IMPROVED PROCEDURES FOR GAS SAMPLING AND ANALYSIS IN THE NATIONAL AIR SAMPLING NETWORK. J. Air Pollution Control Assoc., 17(5):300-304 (May 1967). (Presented at the Air Pollution Control Association Annual Meeting, June 20-24, 1966, San Francisco, Calif., Paper 66-114).

The NASN sampler for the collection of gaseous pollutants has been modified to increase its versatility and efficiency. Oxides of nitrogen are collected in bubblers employing a 70-100 microns frit with a collection efficiency of approximately 50% depending upon the frit porosity. Included in the sampler is a bubbler for the collection of aldehydes in which the aldehyde-MBTH complex is stable at least 2 weeks. This inert bubbler which is constructed of polypropylene and Teflon, makes it possible for samples to be collected over the network and analyzed at a central laboratory. In addition, gaseous ammonia is collected in 0.1 NH2SO4. This collecting system has an efficiency greater than 85%. Low level samples are analyzed automatically employing Nesslerization whereas high level samples from source emissions may be collected in indicating boric acid and titrated with 0.02 NH2SO4. The sampler will accomodate either 50 or 100 ml polypropylene. (Authors' abstract)##

00328

H. Watanabe and T. Nakadoi

FLUOROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF ATMOSPHERIC OZONE. J. Air Pollution Control Assoc. 16, (11) 614.7. Nov. 1966. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966.)

This work has initiated in an effort to obtaina better method for the manual determination of trace amounts of atmospheric ozone. The method described depends upon the fact that ozone oxidizes nonfluorescent 9,10-dihydroacridine to fluorescent acridine. When the ethyl alcohol solution of acridine is acidified by 6N acetic acid, the fluorescence maximum occurs approximately at 482 millimicrons and its intensity is sufficiently strong to be useful in this analysis. Linear relationships between acridine concentrations and fluorescence intensities were obtained from 0.1 to 3.5 micrograms per ml. by measurement with a commercial fluorophotometer. The results indicated that the low concentrations of experimentally prepared ozone measured by this method were in good agreement with those obtained by the phenolphthalin method. This method appeared to be about twice as sensitive as the phenolphthalin method but it is subject to some interference from nitrogen dioxide. (Authors' Abstract)##

00385

B. E. Saltzman and A. R. Wartburg, Jr.

A PRECISION FLOW DILUTION SYSTEM FOR STANDARD LOW CONCENTRATIONS OF NITROGEN DIOXIDE, Anal. Chem. 37, 1261-4, Sept. 1965.

Preparation of primary standard low concentrations of nitrogen dioxide was required to critically evaluate analytical procedures for this gas. A tank mixture of 0.4% nitrogen dioxide in air was metered by an asbestos plug flowmeter into a compact flow dilution system designed for minimum dead volume and back pressure. The mixture was monitored by a calibrated Mast oxidant analyzer. Les than 5 minutes sufficed to reach a steady concentration, which was maintained precisely for many hours. The tank mixture was analyzed gravimetrically by passage through two Ascarite-Anhydrone U-tubes; the fraction of nitrogen dioxide not absorbed was negligible. A small correction to the gravimetric analysis was made for the carbon dioxide in the tank mixture, determined gas chromatographically. It was determined that no correction was necessary for water vapor, since its concentration in the tank mixture was very low. Preliminary studies were made of the stoichiometry of the nitrogen dioxide reaction with Griess-Saltzman reagent. Absorbances of the colors developed showed that one mole of gas was equivalent (within a few per cent) to 0.72 mole of standard nitrite solution Response was linear with concentrations computed from flowmeter readings and the tank analysis, and with sampling time for a fixed concentration. The apparatus and techniqaes should be applicable to many other gases. (Author)##

00469

G.D. Jaros, N.R. Parkin, J.G. Mingle, W.H. Paul

THE FATE OF OXIDES OF NITROGEN THROUGH A DIRECT FIAME AFTERBURNER IN THE EXHAUST OF A GASOLINE ENGINE. Preprint. (Presented at the Second Annual Meeting, Pacific Northwest International Section, Air Pollution Control Association, Portland Oreg., Nov. 5-6, 1964, Paper No. 64-AP-10.)

This paper deals with a study which was made to determine the concentration of N oxides before and after a direct-flame afterburner connected to the exhaust of an internal-combustion engine. The scope of the work covered in this investigation is being confined to a single engine and one afterburner. The laboratory setup consisted of a 6-cylinder overhead camshaft engine direct-connected to an electric dynamometer. Steel flywheels mounted on the dynamometer shaft made possible the simulation of vehicle road operation during acceleration and deceleration. Operation of the engine was automatically controlled to the California sevenmode cycle. Analysis of NOx was accomplished by drawing exhaust gas samples every 2-1/2 sec during the 129 sec of the 7-mode cycly. NOx determinations were made by an instrument partially designed and totally built at Oregon State University. Other constituents of the exhaust gas (CO, CO2 and unburned hydrocarbons) were recorded with continuous, nondispersive infrared detectors. Polotted profiles of instantaneous NOx concentration during the 7-mode cycle time show results before and after the direct-flame afterburner for both rich and lean mixture operation.##

00476

R. C. Seagrave, H. H. Reamer, and B. H. Sage

OXIDES OF NITROGEN IN COMBUSTION: OSCILLATORY COMBUSTION AT ELEVATED PRESSURE. Combust. Flame 9(1):7-18, Mar. 1965.

Measurements of the local perturbations of pressure were made during the oscillatory combustion of mixtures of air and natural gas at elevated pressure under macroscopically steady conditions. The results indicate a complicated effect of the interrelation of mixture ratio and weight rate of flow upon the time-average pressure and the residual quantities of the oxides of nitrogen as well as upon the frequency and amplitude of the perturbations. The results also reveal a complicated microscopic behaviour from both a physical and chemical standpoint at pressures in excess of twice that of the atmosphere. The thermal transfer to the walls of the combustor was a marked function of the nature of the pressure perturbations. The study was concerned with measurements of the perturbations of pressure during oscillatory combustion and with evaluation of the quantities of the oxides of nitrogen found in the exhaust of the combustor. The quantities of the oxides of nitrogen were determined in samples obtained by quenching the products of reaction by flow through a supersonic nozzle. Investigations were carried out at mixture ratios ranging from 0.65 to 1.5 stoichiometric.##

00550

J.N. Pitts, Jr., J.M. Vernon, J.K.S. Wan

A RAPID ACTINOMETER FOR PHOTOCHEMICAL AIR POLLUTION STUDIES. Intern J. Air Water Pollution, Vol. 9:595-600, 1965. (Presented at the Seventh Conference on Methods in Air Pollution Studies, California State Dept. of Public Health, Los Angeles, Calif., Jan. 25-26, 1965.)

The o-nitrobenzaldehyde actinometer, when used in photochemical air pollution studies, has some unique advantages. First, the actinometer could be used in a solid, solution, vapor or a colloidal dispersion system. Second, the absorption spectrum of o-nitrobenzaldehyde has an absorption onset at about 4000 Angstrom units which coincides with the wavelength threshold for the photodissociation of NO2 into NO and O atom. Since sunlight received on the earth's surface contains negligible radiation shorter than 3000 Angstrom units, the solar radiation which causes photochemical reactions involving NO2 as the primary absorbing molecule is in the 4000-3000 Angstrom unit region. While most of the established chemical actinometers are sensitive to wavelength variations, the quantum yield of the rearrangement of o-nitrobenzaldehyde to o-nitrosobenzoic acid is found to be indepdent of wavelength in the region 4000-3000 Angstrom units. Thus, relative intensities of the "active" sunlight fraction can be easily measured by the relative amounts of o-nitrosobenzoic acid formed upon irradiation without resorting to the use of filters, monochromatic device or integrating process.##

00620

W.D. Conner J.S. Nader

AIR SAMPLING WITH PLASTIC BAGS. Am. Ind. Hyg. Assoc. J. Vol. 25:291-297, June, 1964.

An inexpensive sampler has been developed whereby air samples can be collected in plastic bags without pump contamination and shipped to a laboratory for analysis. Data are presented to illustrate how well these bags contain (1) sulfur dioxide, nitrogen dioxide, and ozone in samples collected from synthetically prepared mixtures, and (2) 'hdrocarbons in samples collected from an auto exhaust irradiation chamber. The inorganic samples were in the concentration range of 0.5 to 1.5 ppm, and the hydrocarbon samples were in the concentration range of 7 to 20 ppm. The samples were stored for periods of several days. (Author abstract)##

00792

P.W. West T.P. Ramachandran

SPECTROPHOTOMETRIC DETERMINATION OF NITRATE USING CHROMOTROPIC ACID. Anal. Chim. Acta Vol. 35:317-324, 1966.

A spectrophotometric method is described for the determination of nitrate in the 0.5 to 50 microgram range using chromotropic acid as the reagent and masking agents for the elimination of possible critical interferences due to chloride, chlorine, iron(III) and oxidants. The method can be applied directly for the determination of 0.2-20 mg of nitrate/1 in 2.5-ml samples of water. Over 4000 mg of chloride/1 can be tolerated. The method is simple, rapid and reliable. At the I mg/1 level for nitrate the coefficient of variation at the 95% confidence limit is 4%. There are no interferences. (Author summary)##

00845

SELECTED METHODS FOR THE MEASUREMENT OF AIR POLLUTANTS. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. May 1965. 53 pp.
GPO: 820-519, HEW: 999-AP-11

This manual is an effort to assist in the development of uniform standard methods of analysis of air pollutants. It makes available the judgment and knowledge of a large group of chemists in the Public Health Service. Methods of determining pollutants of common interest are presented in uniform format by chemists on the staff of the Division of Air Pollution. The methods were critically reviewed by the Interbranch Chemical Advisory Committee, which is composed of representatives of the professional chemical groups in all branches of the Division. Methods presented are as follows: For determination of sulfur dioxide, the West and Gaeke and the hydrogen peroxide methods; for determination of nitrogen dioxide and nitric oxide, the Saltzman method; for determination of oxidants, the neutral buffered-potassium iodide and the alkaline potassium iodide methods; for determination of aliphatic aldehydes, the 3-methyl-2 benzothiazolone hydrazone hydrochloride method; for determination of acrolein, the 4-hexylresorcinol method; for determination of formaldehyde, the chromotropic acid method; for determination of sulfate in atmospheric suspended particulates, the turbidimetric bariun sulfate method; and for determination of nitrate in atmospheric suspended particulates, the 2,4 xylenol method. (Author abstract)##

00856

E.L. Kothny P.K. Mueller

FASTER ANALYSES OF NITROGEN DIOXIDE WITH CONTINUOUS AIR ANALYZERS. California Dept. of Public Health, Berkeley, Division of Labs. (AIHL Rept. No. 22 - Revised Edition) (Original paper presented at the 20th Annual Instrument Society of America Conference, Los Angeles, Calif., Oct. 4-7, 1965.) Jan. 1966. 27 pp.

A study concerning the effect of chemical and physical variables on the response of a nitrite reagent is described. For performance comparison, an empirical parameter was developed and applied. Optimization rules were derived and applied. A sub-minute response reagent was developed containing N,N(1-naphthyl, acetyl) ethylene diamine, 2-amino-p-benzenedisulfonic acid. Designs of gas-liquid contact and optical systems were evaluated to match fast response reagents. (Author abstract)##

00866

B.E. Saltzman A.F. Wartburg, Jr.

ABSORPTION TUBE FOR REMOVAL OF INTERFERING SULFUR DIOXIDE IN ANALYSIS OF ATMOSPHERIC OXIDANT. Anal. Chem. Vol. 37:779-782 May 1965. (Presented before the Division of Water and Waste Chemistry, 145th Meeting, American Chemical Society, New York City, Sept. 13, 1963.)

Sulfur dioxide is a serious negative interference in the iodometric determination of atmospheric oxidant by manual and instrumental methods. In many areas the quantities of sulfur dioxide present exceed those of oxidant and thus a false zero analysis may be obtained. Various liquid and solid scrubbing chemicals were investigated for selective removal of sulfur dioxide from an air sample stream; although this was easily done, avoiding concurrent loss of oxidant was more difficult. The deterioration of the scrubbing materials with use also was studied. An absorbent was developed consisting of glass-fiber paper impregnated with chromium trioxide and sulfuric acid. An absorber packed with this completely removed as high as 15 p.p.m. of sulfur dioxide without loss of oxidant. Such absorbers have been used on monitoring instruments and have exhibited useful lifetimes of two weeks of continous operation. Interesting new information on oxidant pollutants is being obrained. (Author abstract)##

00956

P. K. Mueller, E. L. Kothny, N. O. Fansah, and Y. Tokiwa

DESIGN OF AZO-DYE REAGENTS FOR NITROGEN DIOXIDE ANALYSES. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-112.)

Azo dye reagents are used for the spectrophotometric analysis of nitrogen dioxide in air. The performance of these reagents depends upon the molecular structure, pH, ionic activity, and relative concentration of the components. These factors can be tailored to meet the practical requirements of different applications. In current practice the most frequently used azo-dye reagent in continuous analyzers is a formulation containing 5.0% acetic acid, 0.005% N(1-naphthyl)ethylene-diamine dihydrochloride and 0.5% sulfanilic acid in water (modified Saltzman reagent). When using large volumes (liters) of reagent the acetic acid becomes both a hygienic and corrosion nuisance. The design factors for formulating azo-dye reagents were applied to the development of a nuisance free reagent with analogous performance. Several promising reagents were evaluated including tests for stability to light and air oxidation. The performance of new reagents was tested in a continuous air analyzer using nitrogen dioxide streams together with sulfur dioxide, ozone and nitric oxide as possible interferences. A new reagent system is recommended for use in currently operating nitrogen dioxide analyzers. (Author abstract)##

00977

R.S. Yunghans W.A. Munroe

CONTINUOUS MONITORING OF AMBIENT ATMOSPHERES WITH THE TECHNICON AUTOANALYZER. In: Automation in Analytical Chemistry, 6pp. (Presented at the Technicon Symposium, "Automation in Analytical Chemistry," New York City, Sept. 8, 1965.)

A variety of air contaminants can be monitored continuously with Auto/Analyzers. Instrument sensitivity, precision, and response time are more than adequate. The basic modules are all interchangeable, the instrument does not become obsolete as chemical procedures change or are modified, new approaches can be programmed easily, and the equipment is useful in methods research. In addition, automatic baseline programing and restandardization are decidedly advantageous as is the capability for introducing liquid calibration standards at any time.##

01021

B. E. Saltzman and A. L. Mendenhall, Jr.

DESIGN PARAMETERS AND PERFORMANCE OF A MINIATURIZED COLORIMETRIC RECORDING AIR ANALYZER. Anal. Chem. Vol. 36(7):1300-1304, June 1964. (Presented at Division of Water and Waste Chemistry, 145th Meeting, American Chemical Society, New York City, Sept. 12, 1963 and at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif., Jan. 6-7, 1964.)

Design parameters were studied in a prototype model of an improved recording air analyzer. Nitrogen dioxide was absorbed efficiently in a microcolumn packed with 20- to 60-mesh crushed glass in an improved absorbing reagent, which flowed through a rugged spectrophotometer employing a stainless steel cell (with glass windows) and stainless steel tubing connections. The system was designed for minimal liquid holdup to achieve rapid response with small liquid reagent flows. The improved electronic circuit provided a very stable output with only infrequent checks of the 0 to 100% transmittance points. A 90% response time of 3 minutes was achieved. For fluctuating gas concentrations with a period as short as 2 minutes, 62% of the full response amplitude was obtained. The results indicate the success of the rugged miniaturized design. (Author abstract)##

01086

S. Hochheiser and G. A. Rodgers

EVALUATION OF A VISUAL COLOR COMPARATOR METHOD FOR THE DETERMINATION OF ATMOSPHERIC NITROGEN DIOXIDE. Environ. Sci. Technol. 1(1):75-6, Jan. 1967 1966.

A visual color comparator method for estimation of atmospheric nitrogen dioxide concentration was developed and evaluated. Standard color filters to match colors developed in liquid solutions by reaction of NO2 and the Saltzman reagent were prepared at our request by a manufacturer of visual color comparators. Data obtained by use of the visual color comparator and standard color filters were compared with data obtained by spectrophotometric analysis. The comparison study showed that the visual comparison method agrees with the spectrophotometric method within 20 percent. The use of the visual comparator should be useful in preliminary field surveys over a wide area when short-term measurements of NO2 are desirable, and the use of electric power is not feasible. (Author abstract)##

01169

D. L. Ripley, J. M. Clingenpeel, and R. W. Hurn

CONTINUOUS DETERMINATION OF NITROGEN OXIDES IN AIR AND EXHAUST GASES . Intern. J. Air Water Pollution 8, 455-63, 1964.

Nitric oxide is the principal nitrogen oxide present in automobile exhaust gases and in photochemically reactive systems important to air pollution studies. However, only the dioxide is readily determined in instruments that are available and suitable for exhaust research applications. Therefore, in order to use these instruments for determination of nitric oxide it is necessary first to convert the simple oxide to the dioxide form. A solid chemical oxidant has been developed to effect this conversion in a continuous process appropriate to the analytical requirement. The oxidant is particularly useful in atmospheric analyzers used in air pollution studies. The oxidant is prepared by saturating glass fiber paper with a solution of sodium dichromate and sulfuric acid and then drying. A small amount placed in a glass tube through which the gas sample is passed will have no effect on the nitrogen dioxide present in the input and will oxidize the nitric oxide to nitrogen dioxide, after which the total of the two may be determined as nitrogen dioxide. (Author abstract)##

01236

A. L. Linch, S. S. Lord, Jr., K. A. Kubitz, and M. R. DeBrunner

PHOSGENE IN AIR - DEVELOPMENT OF IMPROVED DETECTION PROCEDURES. Am. Ind. Hyg. Assoc. J. 26, 465-74, Oct. 1965. (Presented at the 25th Annual American Industrial Hygiene Conference, Philadelphia, Pa., Apr. 27-30, 1964.)

Air-borne acids, alkalies, and halides introduced intolerable uncertainties into the hydrolysis of phosgene to acid and chloride ion in aqueous collection media. Colorimetric detectors produced reliable results in (1) liquid reagents, (2) impregnated paper, and (3) granular solids. "Ketone" (4,4'-dimethylaminobenzaldehyde in Harrison's reagent in liquid systems was sensitive to 0.1 to 10 ppm of phosgene but insensitive to SO2, H2S, HCl, NO2, or Cl2. Application of Witten and Prostak's 4-(4'-nitrobenzyl) pyridine reagent to paper delivered semiquantitative results by color comparison or gas titration. Adaptation to chlorinated solvents gave sensitivity to 0.01 ppm and a unique calibration technique. A commercial granule-filled length of stain tube further extended mobile survey facilities. (Author abstract)##

01266

I. Cherniack and R. J. Bryan

A COMPARISON STUDY OF VARIOUS TYPES OF OZONE AND OXIDANT DETECTORS WHICH ARE USED FOR ATMOSPHERIC AIR SAMPLING . J. Air Pollution Control Assoc. 15, (8) 351-4, Aug. 1965.

Four continuous automatic analyzers for measurement of atmospheric levels of ozone were used in a calibration and field study. These were (1) a colorimetric instrument based upon detection of iodine released from neutral potassium iodide reagent, (2) a coulometric instrument utilizing the polarization current as a measurement of iodine released by ozone in a cell contacted by potassium iodide reagent, (3) a galvanic cell measuring bromine release by ozone, and (4) an ultraviolet photometer. Some ozone determinations by the manual rubber cracking procedure were included. After calibration with ozone the average relative response to atmospheric ozone levels for each instrument was determined using the colorimetric oxidant analyzer as an arbitrary standard. These responses ranged from 77 percent for the galvanic cell to 98 percent for the photometer. The instrument of choice for any given application would seem to be governed by requirements for precision specificity, portability, reliability, and ease of operation. (Author abstract)##

01269

R. D. Fleming, B. Dimitriades, and R. W. Hurn

PROCEDURES IN SAMPLING AND HANDLING AUTO EXHAUST. J. Air

Both the composition and discharge rate of auto exhausts vary widely and rapidly as speed and load demands upon the engine are changed. Moreover, among the combustion products are compounds that are highly reactive under proper conditions and others that are readily bound by receptive surfaces or absorbents. Under these conditions both the sampling procedure and subsequent sample handling must be such that (1) the sample that is recovered contains all or a fixed proportion of each incremental volume of the total to be represented and (2) the products so sampled are not allowed either to react with each other or to be lost or diminished in sample storage or transfer. Experimental research and development relevant to each requirement have been carried out, and results are reported and discussed. Two methods have been used for recovering small-volume samples representative of the total volume produced during any combination of steady or transient engine modes. One employs a servo-followup system appropriately coupled to both the engine air-intake and to the sampling element; the sampling rate is continuously controlled to bear at all times a fixed ratio to the engine air-intake rate. The second method employs variable dilution, involving addition of diluent gas necessary to maintain a constant total of (exhaust plus diluent). If the mixture is sampled at a constant rate, the sample will contain exhaust appropriately proportioned. Experiments have shown differences in both hydrocarbon and NOx values determined for comparable samples obtained by the two methods. The seriousness of this problem is discussed in relation to the sampling and sample handling procedures that are used. (Author abstract)##

01331

A.F. Wartburg, A.W. Brewer, and J. P. Lodge, Jr.

EVALUATION OF A COULOMETRIC OXIDANT SENSOR. Intern. J Air Water Pollution, Vol. 8: 21-28, 1964.

The American commercial version of the ozone "transmogrifier", a coulometric ozone sensor, developed by one of the authors has been tested for reliability, accuracy and specificity. As with most instruments some substances interfere. The only major, positive interferences discovered so far are from peroxyacids and the simplest hydroperoxides. Sulfur dioxide causes a fairly large negative interference. Techniques are described for maintaining the instrument in good operating condition and for correcting some common malfunctions of the early-type sensors. Despite its relative insensitivity to nitrogen dioxide, the response is still sufficient to permit its use as a nitrogen dioxide monitor in pure systems. Results are given of studies on nitrogen dioxide, of techniques of nitric oxide oxidation, and of field and laboratory ozone measurements. (Author abstract)##

01349

C. R. Thompson and J. O. Ivie

METHODS FOR REDUCING OZONE AND/OR INTRODUCING CONTROLLED LEVELS OF HYDROGEN FLUORIDE INTO AIRSTREAMS. Intern. J. Air Water Pollution (London), Vol. 9:799-805, Dec. 1965.

Methods and equipment are described for reducing ozone in an atmosphere by the addition of metered levels of nitric oxide. The NO is diluted with 50 vol of nitrogen before addition to the ozone containing airstream to prevent premature oxidant of NO to NO2 by oxygen of the air. Simple, reliable dispensing equipment for metering hydrogen fluoride into airstreams at the fractions of micrograms per cubic meter level is also described. This utilizes the constant vapor pressure of HF at 0 C from a relatively concentrated HF solution and variable levels of dispensing are achieved by varying the rate at which air is bubbled through the solution. An automatic valve system is described for providing a 24-hr present schedule of dispensing HF. (Author abstract)##

01357

R.A. Mill, A.H. Hollenbeck, H.J. Paulus

MEASURING THE ENVIRONMENT FOR A BRONCHIAL ASTHMA STUDY. Am. Ind. Hyg. Assoc. J., Vol. 26:510-519, Oct. 1965.

An aerometric study involving the chemical and physical characteristics of the atmosphere is being made in the immediate vicinity of the University of Minnesota campuses in the Twin Cities. The association of asthma incidence in the student boyd to concentrations of air-borne particulates, certain gases, and weather parameters is being determined. A sampling program to determine the particulate and gaseous components of the atmosphere was initiated in order to evaluate the relationship of grain industry pollutants and student asthma. Weather parameters were considered to be of prime importance in the study and were gathered at two locations, one being a television tower equipped with temperature profile instrumentation. Results of several years' study indicated the influence of the grain industry on the total particulate fallout in an area adjacent to the campus. The soiling index from samples at two locations was not high. Concentrations of sulfur dioxide and oxides of nitrogen followed daily and yearly patterns and were below the values found in most midwest cities. Associations between certain weather parameters were found to be quite high, but between the various weather parameters and the incidence of asthma the association was low, with correlation coefficients between 0.16 and -0.16. (Author abstract modified)##

01393

P.H. Hendricks L.B. Larsen

AN EVALUATION OF SELECTED METHODS OF COLLECTION AND ANALYSIS OF LOW CONCENTRATIONS OF OZONE. Am. Ind. Hyg. Assoc. J., Vol. 27:80-84, Feb. 1966.

Seven analytical methods for ozone are evaluated. Equipment used for generating the ozone is discussed. Information concerning methods of collection of ozone is presented. Postassium iodide, phenolphthalein, sodium diphenylamine sulfonate, and fluorescein methods are either nonspecific for ozone or lack sensitivity. The dimethoxystilbene method, in our hands, lacked sensitivity and posed reagent difficulties. The NO2-equivalent method is an excellent research procedure and is the method of choice for field investigations where fluctuating NO2 concentrations are not encountered. The rubber-cracking procedure is empirical, but, as an indicator method, its speed, specificity, and simplicity make this procedure attractive to the industrial hygienist, especially for preliminary surveys. (Author abstract)##

01432

C. Bokhoven and H.L.J. Niessen

THE CONTINUOUS MONITORING OF TRACES OF SO2 IN AIR ON THE BASIS OF DISCOLOURATION OF THE STARCH-IODINE REAGENT WITH PRIOR ELIMINATION OF INTERFERING COMPOUNDS . Intern. J. Air Water Pollution, Vol. 10:233-243, April 1966.

A continuous recording instrument for SO2 monitoring in air pollution studies was developed on the basis of the discolouration of a starch-iodine solution. As distinct from the normal procedure, however, the disturbance by interfering compounds, such as nitrogen dioxide and ozone, can be eliminated without affecting the concentration of SO2. By incorporating an integrating device, 1/2 hr mean values can be printed out. The applicability of these values is discussed with reference to the time constant concept developed by SANDERSON, PENNER and KATZ(1964). (Author abstract)##

01457

R. F. Davis, and W. E. O'Neill

DETERMINATION OF OXIDES OF NITROGEN ON DIESEL EXHAUST GAS BY A MODIFIED SALTZMAN METHOD. Bureau of Mines, Washington, D.C. (RI No. 6790) 1966. 5 pp.

The Bureau of Mines developed a new method for the determination of oxides of nitrogen in diesel exhaust gas. The procedure, a modification of the Saltzman method, uses a NO2 absorbent for the diesel exhaust gas; the colorless absorbent becomes purple on contact with NO2. When used properly this procedure gives satisfactory results in 2 hours, whereas the standard phenoldisulfonic acid method required approximately 8 hours. The new method is not satisfactory for determination of oxides of nitrogen in the overrich fuel to air ratio range. (Author abstract)##

01495

A. A. Strong and J. F. Horton

THE INSTRUMENTATION FOR AUTOMATIC MEASUREMENT AND RECORDING OF LABORATORY-PRODUCED AUTOMOBILE EXHAUST. Preprint. 1966.

A system that automatically measures and records the concentration of six different gases from twelve animal exposure chambers supplied with diluted, laboratory-produced automobile exhaust and other gases is described. The gases are sequentially fed from the animal exposure chambers to the appropriate gas analyzing instrument. Multipoint recorders connected to the output of the gas instruments register the concentrations and control the sequence of the gas measurements. A data acquisition system is also connected to the output of of the gas instruments to record on a punched paper tape the time of measurement and the gas concentration. The data are punched on cards or inserted directly into a digital computer for analysis. (Author abstract)##

01577

A.E. O'Keefte G.C. Ortman

PRIMARY STANDARDS FOR TRACE GAS ANALYSIS. Anal. Chem. 38(6):760-763, May 1966. (Presented at the Division of Water, Air, and Waste Chemistry, 150th Meeting, ACS, Atlantic City, N.J., Sept. 12-17, 1965.)

The permeation rates of gases enclosed in sections of plastic tubing permit the dispensing of nanogram quantities at will. Following an initiation period of a few hours to several weeks, pereation proceeds at a highly constant rate until the enclosed gas is nearly exhausted. The rate of permeation is highly temperature-dependent, but is independent of pressure and composition of the atmosphere. Methods for the fabrication, calibration, and use of permeation tubes are described. Data are presented to illustrate the precision of these methods. (Author abstract)##

01586

M.F. Miller

NOTE ON COMPARISON OF STATISTICAL AND ANALYTICAL RESULTS FOR CALCULATING OXIDES OF NITROGEN CONCENTRATIONS. J. Air Pollution Control Assoc. 17(4):232-234, Apr. 1967..

A question often asked about analytical diffusion models is "How do the analytical results for calculating pollution concentrations compare with those obtained by statistical techniques?" Miller and Holzworth 1966) have developed a simple analytical diffusion model that yields relative pollution concentrations, X/Q, as a function of afternoon mixing depth, mean transport wind speed, and city size. This analytical model may also be used in reverse to determine apparent afternoon source strengths from observed afternoon pollution concentrations. The apparent source strengths may then be used with the model on independent data to estimate pollution concentrations. It is the purpose of this note to compare results of calculating average afternoon concentrations of oxides of nitrogen (NOx) by use of the Miller-Holzworth model with those obtained from statistical regression equations.##

01685

F.L. Meadows W.W. Stalker

THE EVALUATION OF COLLECTION EFFICIENCY AND VARIABILITY OF SAMPLING FOR ATMOSPHERIC NITROGEN DIOXIDE. Am. Ind. Hyg. Assoc. J. 27, 559-66, Dec. 1966. (Presented at the 26th Annual Meeting, American Industrial Hygiene Association, Houston, Tex., May 3-7, 1965.)

A study of the efficiency and variability of the sampling system used to collect nitrogen dioxide in the Alabama Air Pollution and Respiratory Disease Study is described. Experimental sampling was conducted to establish collection efficiency and variability of single and multiple bubblers in series, equipped in each case with either fritted-tip or restricted-opening air dispersers. Comparative evaluation of 0.4 to 0.5 lpm and 0.2 to 0.3 lpm air-flow rates indicated that higher collection efficiency, but greater variability, can be expected with lower air-flow rates. Although fritted-tip bubblers were found to be more efficient than restricted-opening bubblers, restricted-opening bubblers are preferable because their variability is about half that of the fritted-tip bubblers. Sampling variability apparently was not affected by ambient air temperatures, humidity, or the concentration of collecting solution used. Collection efficiency, variability, and the method for empirically determining these factors should be specified when reporting ambient atmospheric nitrogen dioxide. (Author abstract)##

01691

E.C. Tabor C.G. Golden

RESULTS OF FIVE YEARS' OPERATION OF THE NATIONAL GAS SAMPLING NETWORK. J. Air Pollution Control Assoc. 15 (1) 7-11, Jan. 1965.

Sampling for nitrogen and sulfur dioxides was initiated at several National Air Sampling Network stations in 1959 using a sampler developed for that purpose. In 1961 the Gas Sampling Network was expanded to its maximum of 49 stations. Sampling equipment and collecting solutions are supplied and chemical analyses performed by the network laboratories. Sampling and analysis procedures are described briefly. Average and maximum 24-hour concentrations of nitrogen dioxide and sulfur dioxide observed at 48 stations during 1961-1963 are presented. (Author abstract)##

01807

R.I. Larsen, F.B. Benson, G.A. Jutze

IMPROVING THE DYNAMIC RESPONSE OF CONTINUOUS AIR POLLUTANT MEASUREMENTS WITH A COMPUTER. J. Air Pollution Control Assoc. 15, (1) 19-22, Jan. 1965.

A first-order differential equation describes the dynamic response of many continuous air sampling instruments. The time constant, lag time, delay time, and response time are all functions of the volume and flow through the sensor reservoir. All of them can be expressed by the same general equation: t equals k sub 3 V/Q, where t is the selected time variable, k3 is a constant appropriate to the particular system and selected time variable, V is sensor reservoir volume, and Q is the flow rate through the reservoir. The time constant is the time a sampler takes to indicate 63.2% of its final response. Select time constants equal to about half of the shortest desired averaging time. Solve the second equation for the reagent flow to give the desired time constant. Selection of such a time constant eliminates spurious "moise" produced by a fast-responding system. It also provides values within 5% of true for atmospheres that change markedly between successive intervals. If a slow-responding system must be used, use the first equation ot increase apparent response time. A digital computer can be programmed to automatically correct all measured values. Similarly, analog circuitry can be installed in an air sampling instrument ot increase or decrease response time. The analog circuitry to increase response time will continuously solve and plot the first equation. (Author abstract)##

01871

CONTINUOUS AIR MONITORING PROGRAM IN WASHINGTON, D.C. (1962-1963). Public Health Service, Cincinnati, Ohio, Div. OF AIR POLLUTION. SEPT. 1966. 222 PP.
HEW: 999-AP-23; GPO: 827-234-15

This report presents the results of the operation of the Public Health Service Continuous Air Monitoring Program (CAMP) in Washington, D.C., during 1962 land 1963. Data on atmospheric levels of sulfur dioxide, oxides of nitrogen, total oxidants, total hydrocarbons, and carbon monoxide are summarized, analyzed, and discussed. The data are tabulated as hourly, daily, and monthly mean concentrations; background information about Washington and a description of the instrumentation used are included. (Author abstract)##

01876

Schuette, F. J.

PLASTIC BAGS FOR COLLECTION OF GAS SAMPLES. California Dept. of Public Health, Berkeley, Div. of Labs., AIHL-19, 8p., Dec. 1965. Also: Atmos. Environ., 1(4):515-519, July 1967. ((12)) refs.

Criteria for judging what kind of film is likely to be most suitable for a given application are delineated. Information concerning supply sources of needed materials is provided.##

01989

F. A. Bell, Jr.

MEANINGFUL AIR QUALITY MEAUSREMENTS ON A LIMITED BUDGET. J. Air Pollution Control Assoc. 13, (3) 127-31, Mar. 1963. (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

Useful short-term air pollution measurement studies have been conducted in a number of cities throughout the country, demonstrating the potential for local air pollution agencies to carry out effective air pollution sampling studies with limited manpower and financial resources. Experience indicates that the shortterm measurement approach is very useful in spreading knowledge and competency regarding air pollution sampling and analytical techniques particularly regarding measurement of gaseous pollutants. Equipment required for short-term sampling involves only modest costs totaling less than $1400, including $393.70 for gas sampling equipment, $626.50 for particulate matter sampling equipment, and $305 for an analytical spectrophotometer, if needed. For agencies with a severely limited budget, acquisition of even these items of equipment could be scheduled over a period of several years, if necessary. (Author summary modified)##

02045

E. L. Kothny and P. K. Mueller

SUB-MINUTE CONTINUOUS NITROGEN DIOXIDE ANALYSIS. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper VI/9). pp. 182-4.

A study concerning the effect of chemical and physical variables on the response of a nitrite reagent is described. For performance comparison an empirical parameter was developed. With the guidelines resulting from the application of these numbers a fast-response reagent was developed containing 2-amino-p-benzenedisulphonic and sulphuric acid. Designs of gas-liquid contact and optical systems were evaluated to match fast-response reagents. (Author abstract)##

02063

K. Fukui.

THE ALKALINE FILTER PAPER METHOD FOR MEASURING SULPHUR OXIDES, NITROGEN DIOXIDE AND CHLORIDE IN THE ATMOSPHERE. Proc. (Part I) Intern. Clean Air Cong., London, 1966, 231-2. (Paper VII/7.)

The lead peroxide method for measuring pollution by sulphur oxides is time-consuming and liable to discordant results, because of the quality of lead peroxide. The alkaline filter paper method is not affected by this trouble and can be used for the determination not only of sulphur oxides but also of nitrogen dioxide and chloride in the atmosphere. The test papers, after immersion in a 50 percent potassium carbonate solution and air-drying, are exposed to the atmosphere for one month in louvered boxes. After the test period has elapsed the paper is cut into small pieces and treated with water for the extraction. Sulphur oxides, nitrogen dioxide and chloride are determined by the barium chloranilate method, the diazotizing methods and the mercury chloranilate method respectively. (Author Abstract)##

02130

P Eberaneberhorst

(ENGINE COMBUSTION AND ITS EXHAUST GAS PRODUCTS AS A PROBLEM OF HIGH INCIDENCE). Die Motorische Verbrennung und ihre Abgasprodukte als Haufigkeitsproblem. ATZ (Automobiltechnische Zeitschrift) (Stuttgart) 68(8):263-268, Aug. 1966.

The increasing incidence of gasoline engines necessitates reducing the air pollutants from exhaust gas by 40% within the next 10 years. The influence of engine operation on the emission of carbon monoxide, hydrocarbons and nitrogen oxides is described, e.g., in high gear, while changing gears and speeds (7-mode California test), and in neutral. Limiting values for emissions dependent on motor size and normal usage are suggested. Methods to reduce exhaust gas pollutants included fuel injection systems to replace carburetors and controlled turbulence techniques.##

02162

A. P. Altshuller and S. F. Sleva.

VAPOR PHASE DETERMINATION OF OLEFINS BY A COULOMETRIC METHOD. Anal. Chem. (Presented before the Division of Water and Waste Chemistry, 140th Meeting, American Chemical Society. Chicago, Ill., Sept. 1961.) 34, (3) 418-22, Mar. 1962

An instrument based on a bromocoulometric method has been evaluated for analysis of olefins at concentrations between 20 and 1000 p.p.m. The instrument has been calibrated for its vapor phase response to a number of olefins, including ethylene, propylene, propadiene, 1-butene, trans-2-butene, cis-2-butene, isobutylene, 1,3-butadiene, 1-pentene, and 2-methyl-2-butene. The possible interference of a number of substances, including sulfur dioxide, nitric oxide, nitrogen dioxide, hydrogen sulfide, n-butyl sulfide, acrolein, phenol, and m-cresol, has been investigated. Sulfur dioxide, hydrogen sulfide, nitrogen dioxide, and acrolein react appreaciably with the brominating solution. Nitrogen dioxide lowers the response to olefins. Severe interference is experienced when the nitrogen dioxide concentration equals or exceeds that of olefins. Even when the olefins are present in excess, the interference by nitrogen dioxide is sufficient to necessitate removal of most of the latter. In analyses of samples in containers, direct determination of these vapor phase interference effects may be complicated further by gas phase reactions of olefin and nitrogen dioxide, and perhaps by reactions within container walls. With this olefin instrument, diluted automobile exhaust and a variety of synthetic mixtures have been analyzed. Results have compared favorably with those obtained by the colorimetric dimethylaminobenzaldehyde method. (Author abstract)##

02354

K.P. Chrisman K.E. Foster

CALIBRATION OF AUTOMATIC ANALYZERS IN A CONTINUOUS AIR MONITORING PROGRAM. Preprint (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Michigan, June 9-13, 1963.)

The need for uniformity of instrument calibration among the several stations of the Continuous Air Monitoring Program of the U.S. Public Health Service has prompted the development of a comprehensive program of instrument calibration. The program relies heavily upon static and dynamic checks performed by the station operators. The frequency of these checks varies with each specific instrument; but, in all cases, the checks are frequent enough to insure the continued accuracy of the recorded data. The routine checks are substantiated and supplemented by dynamic calibrations performed at all stations by the headquarters staff. The dilution board method for the preparation of standard gas mixtures has been adapted to the requirements of compactness and portability, and has been used successfully in this work, In a conscientious effort to insure and maintain the accuracy of the data produced by the program, further refinements in the method will be made and more suitable new methods will be adopted as they are developed. (Author's summary)##

02368

J.N. Pitts, Jr. J.H. Sharp

SOME ASPECTS OF THE PHOTOCHEMISTRY OF NITROGEN DIOXIDE. Proc. Tech. Meeting West Coast Sect., Air Pollution Control Assoc., 3rd, Monterey, Calif., 1963. 76-92.

The basic theories and techniques of photochemistry can be applied to gain insight into the mechanism of the photodecomposition of nitrogen dioxide. While this approach is rather "academic" in this particular study, nevertheless, the results have bearing on the problem of photochemical air pollution. Two particularly intriguing questions raised and not answered of considerable basic and practical significance are: (1) can one confidently extrapolate photochemical and kinetic data on NO2 from the mm. pressure range to the ppm. range?; (2) why doesn't the molecule, NO2 a highly reactive compound, react with the common organic constituents of smog, in particular, olefins, when it is raised to an excited electronic state by absorption of 4358A radiation? The search for theoretical and experimental answers to these questions is currently going on. It seems certain that the results will have "practical" applications to photochemical air pollution as well as being of general scientific interest.##

02377

SLATER, R. W.

LOW-COST MEASUREMENT OF AIR POLLUTION. (IN: PROCEEDINGS OF THE EIGHTH ANNUAL AIR AND WATER POLLUTION CONFERENCE.) Univ. Mo. Bull. 64 (24), 49-53 (Aug. 26, 1963). Also published in Ind. Water Wastes 8 (6), 30-3 (Dec. 1963). (Presented at the Eighth Annual Air and Water Pollution Conference, Columbia, Mo., Nov. 13, 1962.)

An air pollution monitoring program is described that can be initiated and maintained by a local air pollution agency or health department at a moderate cost. Simple, inexpensive methods of sampling and analysis for gaseous pollutants and particulates are outlined and a detailed equipment cost breakdown is given. (Author summary)##

02378

R. Smith, A. H. Rose, and R. Kruse.

AN AUTO-EXHAUST PROPORTIONAL SAMPLER. INTERN. J. AIR WATER Pollution (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.) 8, 427-40, Sept. 1964.

The development of an instrument to obtain a proportional sample of auto exhaust gas is described. The proportional sampler is a servo device, which controls the flow of exhaust gas in the sampling line to maintain it at a fixed percentage of the carburetor air flow rate. The flow rates in carburetor and sample line are measured continuously by means of laminar-flow elements and associated pressure-difference transducers. The proportional sampler is used in a vehicle on the road to provide a representative sample of exhaust gas, which is then analyzed to obtained mole-fraction measurements of various air contaminants in the vehicle exhaust. The total volume of air entering the carburetor is also measured. The values for total air volume entering the carburetor and mole fraction of contaminants are used to calculate the emission rates in pounds of each air contaminant emitted per vehicle mile traveled. (Author abstract)##

02406

A.E. Barrington

INSTANTEOUS MONITORING OF MULTICOMPONENT EXPIRED GASES. GCA Corp., Bedford, Mass. (Rept. CR-619.) Dec. 1966. 17 pp.
CFSTI, NASA

Because of the urgent requirements of the manned space flight program, the prototype gas analyzers described below were developed specifically for aerospace applications. Their design thus inevitably was subject to restrictions of weight, volume and power consumption. Nevertheless, their operational performance has been most encouraging. The sensing element of the gas analyzer is called a mass spectrometer whose concept utilizes two basic physical phenomena: first, gaseous atoms and molecules can readily be charged electrically; second, there is a selective effect by electric and magnetic forces on such charged particles which depends on the atomic or molecular mass. A complete sampling and sensing system for 12 constituent gases, utilizing a magnetic deflection mass spectrometer is shown. It is designed to monitor H_2, CO, CH_4, NH_3, H_2O, N_2, COH, O_2, H_2S, HC, CO_2 AND $COOH$. IT includes 4 sample inlet capillaries, a calibration sample, a liquid nitrogen chilled sorption pump and an electronic ion pump.##

02415

C.W. Louw

ATMOSPHERIC POLLUTANTS AND THEIR ANALYSIS (SPECIAL REPORT SMOG 2). Council for Scientific and Industrial Research, Pretoria, (South Africa). Air Pollution Research Group 1966. 60 pp.

In view of the recently passed Act on Air Pollution (No. 45 of 1965) in South Africa and the anticipated increase in interest and analytical activity in this field, it was felt that the need existed for an up-to-date survey of air pollutants and their analysis. A review report was consequently prepared and is presented here. Aspects such as the types, sources and occurrence, concentrations and methods of analysis of the various pollutants are discussed. Also, recommendations are made with regard to the selection of suitable analytical methods. (Author abstract)##

02439

A. V. Demidov, L. A. Mokhov, and B. S. Levine (Tr.)

RAPID METHODS FOR THE DETERMINATION OF HARMFUL GASES AND VAPORS IN THE AIR. Vol. 10 of U.S.S.R. Literature on Air Pollution and Related occupational Diseases. Medgiz, Moscow, Russia. (Technical Transl. No. TT 66-11767.) 1962. pp. 114.

Volume 10 of the survey series "U.S.S.R. Literature on Air Pollution and Related Occupational Diseases" is a translation of A. V. Demidov's and L. A. Molhov's book "Rapid Methods for the Determination of Harmful Gases and Vapors in the Air" (Yekopehhlie Metoubi Oiipeuejiehnr B B Boeuyxe Bpeuhlix N Iopooopaehlix Bewectb), published by Medgiz of Moscow in 1962. The greater part of the outlined procedures have been developed by U.S.S.R. analytical chemists, while some were taken from literature of other countries. The collection of tests appears to be intended primarily for the detection of dangerous gaseous and vaporous air pollutants in indoor working premises. For each harmful gas or vapor qualitative as well as closely approximate quantitative procedures are given to make possible the early determination of dangerous harmful gas and vapor concentration in the air of working premises and to forestall the occurrence of serious accidents. The volume was intended to meet the needs of smaller laboratories and of field industrial laboratory workers.##

02441

M. E. Eaton, Jr.

AN ELECTROCHEMICAL SENSOR FOR DETECTING TRACE CONTAMINANTS IN AIR (MASTER'S THESIS). Air Force Inst. of Techn., Wright-Patterson AFB, Ohio, School of Engineering. Aug. 1963. 88 PP.
CFSTI AD 422659

A two-terminal electrochemical cell was used to detect trace amounts of an oxidizing agent in air. An investigation of the cell's electrical parameters was made while the cell was in uncontaminated air, and while exposed to chlorine or nitrogen dioxide. An equivalent was obtained. The cell, without any external power or circuitry, can detect concentrations below the threshold limit values for chlorine and nitrogen dioxide. The cell output can be increased by passing a small DC current through the cell. This current also improves the cell's recovery time.##

02492

M. E. Morrison, P. G. Rinker, and W. H. Corcoran.

QUANTITATIVE DETERMINATION OF PARTS-PER-MILLION QUANTITIES OF NITROGEN DIOXIDE IN NITROGEN AND OXYGEN BY ELECTRON-CAPTURE DETECTION IN GAS CHROMATOGRAPHY. Anal Chem. 36(12):2256-2259, Nov. 1964

An electron-capture detector was used in a gas chromatography to measure parts-per-million quantities of nitrogen dioxide in a ternary mixture of nitrogen, oxygen, and nitrogen dioxide. For concentrations of nitrogen dioxide from 5 to 150 p.p.m. and for oxygen present to the extent of 9% by volume in nitrogen, the standard deviation of the best curve through the points showing response vs. concentration was 2 p.p.m. compared to about 3 p.p.m. for chemical techniques. The main advantages of gas chromatography are the short time for analysis and the small samples (.5 cc) required. (Author abstract)##

02520

A. P. Mitra

AN IONOSPHERIC ESTIMATE OF NITRIC OXIDE CONCENTRATION IN THE D-REGION. Pennsylvania State Univ., University Park, Ionosphere Research Lab. (AFCRL-66-359) (Scientific Rept. No. 265) Feb. 15, 1966. 24 pp.

It is shown that the dissimilar nature in the solar cycle variations in the three major competing ionizing sources for the D-region (e.g. X-rays below 8A, Lyman-alpha radiation and cosmic rays) can be used to provide an estimate for the concentration of the neutral nitric oxide at and near 70 km. Use of the electron density profiles recently given by Deeks (1965) for sunspot minimum and maximum conditions for equinox in middle lattitudes gives a nitric oxide concentration of 400000/cc around 72 km, about one hundredth of Barth's rocket-deduced value. When this value is integrated with currently available photochemical information, the following empirical distribution is indicated: n(NO) equals 0.02 exp (- 3300/T)n(02) plus 0.0000005 n(O). (Author abstract modified)##

02560

N.F. Koshelev, Yu. G. Ulitin

METHOD FOR THE DETERMINATION OF TOTAL NITROGEN OXIDES IN AIR. (Metod summarnogo opredeleniya okislov azota v vozdukhe.) Hyg. Sanit. 31, (3) 349-52, Mar. 1966.
CFSTI: TT66-51160/1-3

1. Determination of nitrogen oxides by means of the Griss-Ilosvay reagent yields results which are too low. This method cannot therefore be recommended for quantitative estimation of the content of these compounds in air, particularly if the air is contaminated by nitric acid fumes. 2. In analyzing air for its total content of oxygen compounds of nitrogen, the analytical method used must be suitable for estimating both the trivalent and the pentavalent nitrogen. 3. The sulfophenol method suffers from several disadvantages, which make it unsuitable for large-scale investigations. 4. A simple, accurate, and fairly rapid method is described for determining the total oxygen compunds of nitrogen in air. This can be used for routine air pollution control studies. The oxygen compounds of nitrogen in air. This can be used for routine air pollution control studies. The oxygen compounds of nitrogen are absorbed not in an oxidizing mixture, but in a 0.1 N alkali solution, thus reducing the absorption time to 1 hour. Instead of the whole sample, only 2 or 3 ml need to be evaporated and this is carried out after the trivalent nitrogen has been converted to the pentavalent form by hydrogen peroxide in a porcelain dish. Finally the phenolsulfonic acid is replaced by salicylic acid, which also produces yellow-colored nitro-derivatives, the sensitivity attaining 2 micrograms N205 in the volume analyzed.##

02645

H. Hummel

INDUSTRIAL GAS MEASUREMENT FOR CLEAN-AIR MAINTENANCE. Staub (English Translation) 25, (2) 11-18, Feb. 1965
CFSTI: TT 66-51040/2

This article deals mainly with emission-concentration measurements directly concerning the plant. In addition, trace-element recorders for immission control in the plant area or outside it was also mentioned. Several plants use mobile recording stations for this purpose. Apart from current control, immission instruments will in future be important for the determination of ground loading. The ground loading in respect to a specific noxious substance (e.g., SO2) is a measure of the average degree of nuisance caused by immissions in a certain area. For a planned installation, e.g., a boiler plant, the ground loading for the basis for chosen location must be ascertained. This forms the basis for granting the building permit. According to suggested and practiced methods, the ground loading is established in the following manner. Numerous points are established in a fixed coordinate grid around the location to be examined. Individual sampling is carried out at these points by a fixed program over a long period. By using a precisely determined statistical evaluation method, the ground loading can be deduced from the data. The statistical character of the immission, which depends on wind and atmospheric conditions, is thus taken into consideration. The reliability of this still imperfect method cannot be discussed; it is however certain that this method is expensive and requires considerable manpower. On the other hand, it can easily be shown that given a correct evaluation of the strip charts (possibly by electronic scanning) the use of recording instruments at a few points will provide an equally reliable measure of ground loading at less expense. This method would also include the nighttime which hitherto has not been included. In spite of this, and taking into consideration the value of recording methods for obtaining statistical relationships, the role of individual analysis will remain unchallenged in future. This is primarily due to the fact that the development of a reliable recording method is far more expensive than individual analysis. Therefore, and because of the greater instrumentation requirements, recording instruments will be used only for the most important duties. (Author summary)##

02673

H. Fuhrmann

RECORDING MEASUREMENTS OF GASEOUS IMISSION CONCENTRATIONS WITH A NEW ANALYZER. Staub (English Translation) 25, (7) 19-24, JULY 1965.
   CFSTI TT 66-51040/7

For monitoring gases contributing to air pollution, SO2 and NO plus NO2 and O3 in particular, recording analysers find increasing application. The paper describes an automatic colorimetric analyser for the repetitive measurement of immission concentrations. The instrument is characterized by high sensitivity down to a few micrograms cu m, excellent selectivity, and minimum maintenance requirements. Simple switchover means permit the same instrument to be used for both half-hour mean values and short-time readings. The Imcometer described by the author is designed for simple and rapid change-over to various gaseous compoenents. It has been fieldtested in a northern suburb of Hamburg. The recorded daily readings for SO2, NO plus NO2, and O3 are discussed. (Author summary)##

02681

E. Lahmann

METHODS FOR MEASURING GASEOUS AIR POLLUTIONS. Staub (English TRANSLATION) 25, (9) 17-22, SEPT. 1965.
   CFSTI TT 66-51040/9

As the analysis of air pollutants has become a very extensive area of microchemistry, the statements included herein are limited to the principles involved in the analysis of the most important extraneous gases. Empirical, batch and continuous methods are the basic means for investigating gaseous air pollutants. The advantages and disadvantages of these methods are presented. Subsequently, the most important methods used at present for determination of sulfur dioxide, nitrogen dioxide, hydrogen sulfide, fluorides, oxidants, carbon monoxide and hydrocarbons are discussed.##

02732

I. R. Cohen, T. C. Purcell, and A. P. Altshuller

ANALYSIS OF THE OXIDANT IN PHOTOOXIDATION REACTIONS. Environ. Sci. Technol. 1, (3) 247-52, Mar. 1967. (Presented at the 152nd Meeting, American Chemical Society, New York City, Sept. 14, 1966.)

A number of methods for determining the identity and concentration of the oxidants produced photochemically in model systems are presented. The application of these methods to atmospheric sampling is discussed. The effects of the following variables are considered: spectral characteristics of the reagent blends and the colored species in question; temperature; order of addition, color stability and rate of color formation; reagent concentration; hydrogen ion concentration (pH); and various determinate errors. Calibration curves, molar absorptivities, and interferences are presented in detail. (Author abstract)##

02745

S. Hochheiser and W. J. Basbagill

COMPARISON AMONG METHODS OF SAMPLING AND ANALYZING AIR POLLUTANTS - DESIGN OF EXPERIMENTAL PROGRAM. Preprint. (Presented at the Sixth Conference of Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Jan. 6-7, 1964.)

A mobile air-sampling laboratory used to sample atmospheric pollutants is described. Various manual and automatic methods are compared by means of atmospheric samples to determine the relationship among methods and the variables that may affect each method. These studies were designed to evaluate methods applied to the sampling and analysis of air pollutants and to determine the need for further laboratory and field evaluations. The chemical and meteorological variables measured in these studies and the sampling program are delineated. (Author summary)##

02747

W. J. Jacumin and L. A. Ripperton

FURTHER EFFECTS OF TEMPERATURE AND PRESSURE ON PHOTOCHEMICAL OXIDANT PRODUCTION. J. Air Pollution Control Assoc. 14, (3) 96-7, Mar. 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963, Paper No. 63-101.)

Oxidant production was observed for a photochemical reactant system NO2 plus hexene-1 over a pressure range of 640 to 860 mm Hg at temperatures of 14, 25, and 35 C. An apparent inhibition took place around 714 mm at all temperatures. From a low at 714 oxidants values rose to a secondary peak at 700 mm and then dropped with decreasing pressure. The significance of these results is discussed. (Author abstract)##

02763

G.A. Rost D.J. Swartz

ADVANCES IN CONTINUOUS AIR POLLUTION ANALYZERS. Preprint. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, Paper No. 63-9.)

The evolution of air pollution instrumentation by size has been reviewed. The analysis methods in general usage and information on the specific instrumentation involved show that a steady decrease in analyzer size has occurred with negligible loss in sensitivity or specificity. The cost of the nonportable laboratory analyzers has been high; as a result, cities and communities are in general unable to afford this equipment. Smaller or semi-portable instruments are less costly and provide versatility to the users. Now that electrochemical monitors are available for the analysis of one or two pollutants, conjecture about the future of complete air sampling systems is of interest. Although these monitors have not been applied to the analysis of all air pollutants, it is anticipated that within reasonable lengths of time sufficiently sensitive and selective methods will be developed. This, in turn, menas that it would be possible to have an entire air sampling station consisting of five or six analyzers on a single table top. These units would require only minor accessories to be completely portable. In addition, with the inherent simplicity of electrochemical analyzers, the cost per instrument will be lower, thus more monitoring networks can be operated per available dollar, and the technician skill required to operate the equipment can be minimized. Tables and illustrations.##

02785

R. H. Linnell and W. E. Scott

DIESEL EXHAUST ANALYSIS (PRELIMINARY RESULTS). Arch. Environ. Health 5, 616-25, Dec. 1962.

Interest in the emissions from the exhaust of diesel engines on the road is rising mainly because interest in possible sources of air pollution has been steadily increasing. However, the problems of sampling and analysis of diesel exhaust have not been solved yet. This paper outlines of the techniques being used and some being evaluated for the first time for exhaust analysis. Many analytical problems remain to be solved. Some results are presented which are considered preliminary.##

02799

E. Sawicki and J. L. Noe

A SENSITIVE NEW METHOD FOR THE DETERMINATION OF NITRITES AND NITROGEN DIOXIDE WITH 4-AMINOAZOBENZENE-1-NAPHTHYLAMINE. Anal. Chim. Acta 25, 166-9, 1961.

A sensitive method for the determination of nitrites is introduced. The method should also be applicable to the determination of nitrogen dioxide. The test consists of the reaction of 4-aminoazobenzene and 1-naphthylamine with nitrous acid to form the blue dication of 4-(p-phenylazophenylazo)-1-naphthylamine. Beer's Law was obeyed from 0.5 to over 15 micrograms of nitrite ion per 15 ml of final solution. Spectrophotometrically it is possible to detect part of nitrite ion in 60 million parts of solution. (Author summary)##

02845

M. D. Thomas and R. E. Amtower

GAS DILUTION APPARATUS FOR PREPARING REPRODUCIBLE DYNAMIC GAS MIXTURES IN ANY DESIRED CONCENTRATION AND COMPLEXITY. J. Air Pollution Control Assoc. 16, (11) 618-23, Nov. 1966

The development and testing of analytical methods for determining gaseous air pollutants would be expedited by the availability of known gas mixtures, reproducibly prepared in any desired quantity, complexity, and concentration. A portable gas dilution apparatus was constructed by which reproducible known mixtures of the common air pollutants added to carbon filtered air can be prepared. Sulfur dioxide mixtures with and without the addition of nitrogen dioxide and/or ozone have been analyzed by the conductimetric, titrimetric, turbimetric, and colorimetric methods. Excellent analytical agreement with the concentration obtained from the volumes of SO2, NO2, hydrogen sulfide, and air that are mixed has been shown by all these methods when an efficient absorber is used although the titrimetric method tended to give slightly lower results.##

02883L

M. N. Hirsh, P. N. Eisner, G. M. Halpern, and J. A. Slevin

IONIZATION AND ELECTRON LOSS SIMULATION IN ATMOSPHERIC GASES (QUARTERLY REPT. NO. 2, SEPT. 1 - NOV. 30, 1965. Dewey (G.C.) Corp., New York City. Mar. 1966. 27 pp.
DDC AD 486307

This report covers work performed during the period 1 September through 30 November 1965. The report begins with a description of experimental modifications made to the mass spectrometer to increase its utility as a quantitative instrument. The theoretical work, including both a summary of current work on the numerical computation of the low pressure oxygen model, and some studies of the chemistry resulting from the addition of a trace of nitrogen to the low-pressure oxygen plasma, are presented.##

02948

R. C. Seagrave, H. H. Reamer, and B. H. Sage

OXIDES OF NITROGEN IN COMBUSTION: SOME MICROSCOPIC MEASUREMENTS. Combust. Flame 8, (1) 11-9, Mar. 1964

Measurements of the perturbations of pressure and of total and monochromatic flame intensity were made during the oscillatory combustion of natural gas and air at atmospheric pressure. The results, which are presented in tabular and graphical form, indicate a significant fluctuation in the mole fractions of water and carbon dioxide during each cyclic perturbation. (Author abstract)##

03010

H. Devorkin, R.L. Chass, A.P. Fudurich, C.V. Kanter

SOURCE TESTING MANUAL. Los Angeles County Air Pollution Control District, Calif. 181 pp., Nov. 1965

Specialized methods and techniques for the curtailment of contaminants being released into the atmosphere, developed in the laboratory and in the field are described in this manual. These methods are concerned primarily with the measurement of emissions from stationary sources, and in general, with little or no modification, these methods can also be used for testing vehicles or other moving sources. Information obtained form source tests is invaluable as a guide in selecting appropriate control equipment and improving the design of future installations to minimize the discharge of air contaminants. Following topics are discussed: Planning a source test; Determination of gas flow rate; Collection and analysis of particulate matter, and of gaseous constituents; Odor measurement; Source test report. The appendixes deal with rules and regulations, conversion factors and constants, and auxiliary field sampling equipment.##

03096

N.A. Lyshkow

A RAPID AND SENSITIVE COLORIMETRIC REAGENT FOR NITROGEN DIOXIDE IN AIR. J. Air Pollution Control Assoc. 15, (10) 481-4, Oct. 1965 (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965)

High speed instrumentation requires a colorimetric reagent capable of detecting traces of nitrogen dioxide with little delay for color development. Rate of color development and sensitivity of Griess-type reagent have been improved by adding a promoter (R-salt) and optimizing the concentrations of diazotizing and coupling reagents. Field tests show that the new instrument -reagent combination can resolve short-duration peaks in NOi concentrations of 5 to 10 pphm. (Author abstract)##

03099

L. Pierce, Y. Tokiwa, K. Nishikawa

EVALUATION OF CONTACT COLUMNS FOR NITROGEN DIOXIDE ABSORPTION. J. Air Pollution Control Assoc. 15, (5) 204-6, May 1965 (Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif., Jan. 6-7, 1964.)

The absorption efficiencies of six, 10-, 13-, and 60-turn spiral columns were studied using half-strength and modified Saltzman reagents. The 60-turn column was 100% efficient at all air and liquid flow rates using half-strength Saltzman reagent. The 13-turn column was 100% efficient at an air flow rate of 290 ml/min using half-strength Saltzman reagent and at both 290 and 500 ml/,in using modified Saltzman reagent. The results of the study have led to the adoption of 13-turn spiral contact columns together with the use of modified Saltzman reagent for all State operated NO2 monitoring instruments. (Author summary)##

03119

S.R. Craxford

STANDARDISATION OF MEASURING AND CONTROL APPARATUS AND OF METHODS OF MEASURING. European Conf. on Air Pollution, Strasbourg, 1964. p. 139-146.

From its study of the methods of measurement of air pollutants the OECD Working Party found that the methods adopted on an international basis fit into 3 categories: (1) well established methods suitable for international standardization; (2) methods considered to be of interim nature; (3) methods of known limited application. In general, the sampling procedures are considered to be as important as the analytical in measuring atmospheric air pollutants. The relative importance of air pollutants as revealed from study of national reports remains, since 1957, dusts, or deposited material, smoke, or suspended particulate material, and SO2. Sulfuric acid and other sulfates, oxides of nitrogen and carbon monoxide, compounds of fluorine and ammonia come next in importance. Greater emphasis in CO concentrations and the affects on health reflects greater concern with automotive emissions. Also, there is growing concern about the effects of polynuclear aromatic compounds which are present in the atmosphere, and of which there are many known carcinogens. Various standard analytical procedures are discussed briefly.##

03218

J. Krizek.

DETERMINATION OF NITROGEN OXIDES IN SMALL CONCENTRATIONS. (Stanoveni nizkych koncentraci kyslicniku.) Chem Prumysl (Prague) 16, (9) 558-9, 1966. Czech. (Tr.) (Translated as JPRS-R-8583-D.)

The author revises the polarographic and colorimetric method for determining nitrogen oxides. He finds that improper composition of the absorption solution is responsible for the biased (systematically lower) experimental results; potassium nitrite, formed if the gas is absorbed in 0.1N KOH solution containing H2O2, decomposes in acid medium during further operations. He therefore recommends using the H2O2 solution for absorption with subsequent alkalization before the sample is boiled down. He discusses the applicability and suitability of methods for determining NO2 which utilize the formation of azo dyes.##

03245

S. Yanagisawa, N. Yamate, S. Smitsuzawa, and M. Mori

CONTINUOUS DETERMINATION OF NITRIC OXIDE AND NITROGEN DIOXIDE IN THE ATMOSPHERE. Buli. Chem. Soc. Japan (Tokyo) 39, (10) 2173-8, OCT. 1966

Continuous determinations of nitric oxide and nitrogen dioxide in the atmospheric air by the use of modified Saltzman reagent is described. Measurement was made intermittenly, once every 30 min., by an automatic continuous analyzer equipped with a single-path colorimeter. The response of the analyzer was obtained as an average of the concentration of nitrogen oxides over a period of 25 min. Two bubblers were used for absorbing nitrogen oxides into the modified Saltzman reagent, whose transmittance was measured for the determination: One bubbler was designated to obsorb nitrogen dioxide, and the other, nitric oxide plus nitrogen dioxide after the oxidation of the nitric oxide by permanganate. The oxidizing efficiency of the permanganate was 96-100 per cent. The acetic acid in the Saltzman reagent was replaced with n-propyl alcohol in the modified Saltzman reagent; the spontaneous coloration and corrosive quality of the reagent was decreased by this substitution. The concentration of nitric oxide was obtained from the difference between the two responsed of the analyzer, while the concentration of nitrogen dioxide could be read directly from the recorder. The transmittance ratio method was applied to the measurements. Accurate determinations were possible even at high blank values. The reagent was used repeatedly by cycling it on the basis of measuring the difference in coloration before and after the absorption of nitrogen oxides. The analyzer could be used for a long period without changing the reagent. (Author summary)##

03402

03402
M. Fossard, R. G. Rinker, W. H. Corcoran

DETERMINATION OF SMALL QUANTITIES OF NITRIC OXIDE AND NITROGEN DIOXIDE IN NITROGEN BY GAS CHROMATOGRAPHY. Am. Soc. Testing Mater., Spec. Tech. Publ. 352, 56-9 pp., Dec. 1963.
(Presented at the Symposium on Air-Pollution Measurement Methods, Los Angeles, Calif., Oct. 5, 1962.)

Studies were made on the determination of nitric oxide (NO) and nitrogen dioxide (NO2) present at less than 5000 ppm by volume in nitrogen. The work was a continuation of previous studies on the quantitative analysis of small amounts of nitric oxide in nitrogen by gas chromatography using a silica gel column. The nature of the results suggests that NO and NO2 are irreversibly adsorbed in small quantities on silica gel. This strong adsorption, separate from a physical or van der Waals adsorption, forms a basis for separation of small amounts of NO and NO2 subsequent to an initial conditioning of the silica gel with these oxides of nitrogen (N2). (Author abstract)##

03425

S. B. Smith and R. J. Grant.

A NON-SELECTIVE COLLECTOR FOR SAMPLING GASEOUS AIR POLLUTANTS FINAL REPT.) Pittsburgh Coke and Chemical Co., Research and Development Dept. Dec. 15, 1958. 63 pp.

Tests of the retentive power of various adsorbents indicated activated carbon is superior to silica gel and molecular sieves for the non-selective collection of air pollutant gases. When dry ice is used as a refrigerant on a carbon column it is possible to collect methane and all gases of lower volatility in a sample of reasonable size. Certain oxidizing gases such as No, NO2 and O3 appear to react with activated carbon and must be considered separately. Columns of various sizes were tested over a wide range of gas concentrations and a column containing 55 grams of Pittsburgh HDL activated carbon chosen to sample 20 liters of air for light contaminants. A smaller column for operation at room temperature containing 1.5 grams of the same carbon may be used ahead of the refrigerated column to collect C4 and higher compounds from 100 liters of air. A field collector kit was designed which affords a preliminary filtration and drying of the air sample, positive displacement measurement of the sample volume, continuous flow measurement and mechanical pumping of the air sample. A helium flushing system for the refrigerated collector is also provided to remove the bulk of air adsorbed from the sample. Prototype columns were tested satisfactorily for retention under exaggerated test conditions on selected hydrocarbon vapors. A few recovery runs indicated that good recovery can be confidently expected after further experimental development of recovery techniques. (Author summary)##

03520

R. I. Larsen

PARAMETERS OF AEROMETRIC MEASUREMENTS FOR AIR POLLUTION RESEARCH. Am. Ind. Hyg. Assoc. J. 22,(2) 97-101, Apr. 1961.

A brief description of a continuous gas sampling network is presented in which a number of air pollutants is to be measured in six United States cities beginning about mid 1961. Parameters are presented of aerometric measurements from a two year study of sulfur dioxide in Louisville, Kentucky, to be related to health and other effects. Six equations are developed to depict the frequency, duration, and air pollution dosage. (Author abstract)##

03527

R. O. McCaldin

EVALUATING AIR POLLUTION PROBLEMS (ACCEPTABLE EQUIPMENT AND PROCEDURES). Arch. Environ. Health 2, 228-33, Mar. 1961.

Some of the more common equipment used in making environmental air quality determination, such as Hi-Volume Samplers, Filter Tape Samplers, Gas Samplers, and simplified monitoring techniques, are discussed. Hi-Volume Samplers are frequently used to measure suspended particulate which may consist of smoke, dust, or other solids small enough to remain air-borne for long periods. This includes particulates under 100 microns in diam, and, for the most part, those less than 1 micron in diam. Fiber glass filters commonly used with this sampler collect practically all particulates down to 0.3 micron in diam. The sampler itself consists of a vacuum cleaner motor with mounting to accomodate an 8-in by 10-in filter. Filter Tape Samplers are commonly used in the field studies and usually are equipped with a diaphragm pump to draw air through at a rate of about 7 liters/min. Various automatic instruments are used for the continous collection and recording of gaseous pollutants. However, various manual or semimanually operated bubbler collection trains have been used in the majority of gaseous measurements. Simplified monitoring techniques are discussed in conjunction with dustfall sulfation rates, H2S, corrosion and fluoride sampling.##

03537

T. R. Hauser, D. W. Bradley

EFFECT OF INTERFERING SUBSTANCES AND PROLONGED SAMPLING ON THE 1,2-DI-(4-PYRIDYL)ETHYLENE METHOD FOR DETERMINATION OF OZONE IN AIR. Anal. Chem., 39(10):1184-1186, Aug. 1967. 4 refs. (Presented at the Division of Water, Air, and Waste Chemistry, 153rd Meeting, ACS, Miami Beach, Fla., April 1967.)

A new method for the sampling and analysis of ozone in the atmosphere involves the collection of atmospheric ozone in a solution of 1,2-di-(4-pyridyl)ethylene (PE) in glacial acetic acid, reaction of the ozone with the PE via the ozonolysis reaction to form pyridine-4-aldehyde, and colorimetric analysis of the resultant pyridine-4-aldehyde using a modification of the 3-methyl-2-benzothiazolone hydrazone method. This paper describes the effect of two additional analytical parameters on the PE method. These parameters, namely the effedt of possible interfering substances present in the atmosphere and the effect of prolonged sampling time on final analysis, are very important when any analytical procedure is applied to the field analysis of atmospheric contaminants. The results demonstrate that the method can be used for 24-hr. sampling simply by increasing the volume of absorbing solution since there is no loss of collected ozone from the absorbing solution during a 24 hr. sampling period due to a possible aeration effect.##

03542L

L. Reckner, F. R. Taylor, W. E. Scott, H. J. Wimette

DIESEL EXHAUST COMPOSITION, ODOR AND EYE IRRITATION (PROGRESS REPORT MAY 1, 1962 TO FEB 15, 1963. Preprint 1963.

Further work with the two-cycle 6-cylinder V-type diesel engine is reported which which covers solid and liquid particulate emissions at various operating conditions, odor intensity and eye irritation observations by a human panel at three operating conditions, analyses of the particulate for polycyclic aromatic hydrocarbons and further analyses of the gaseous emissions by long-path infrared and colorimetric techniques. A number of polycyclic aromatic hydrocarbons, including benzo(a)pyrene and several other compounds with reported positive biological activity, have been detected in diesel exhaust by fluorescence spectroscopy. The concentrations of most polycyclics were highest from 1/2 load to 7/8 load with a sharp decrease from 7/8 load to full load. The benzo(a)pyrene concentrations found in diesel exhaust (0.6 to 7.4 micrograms per cubic meter) were lower than the 8.5 micrograms per cubic meter recently reported for automobile exhaust, but the diesel produced more benzo(a)pyrene (0.15 to 1.3 milligrams) per gallon of fuel than the automobile (0.27 milligrams). Fluorescence analyses of new and used lubricating oil and the rate of oil consumption indicate that the contribution of the oil to the exhaust particulate of this engine is negligible. Values for the emissions of nitrogen dioxide have been revised downward as a result of using an improved sampling technique which minimizes the oxidation of nitric oxide to nitrogen dioxide. Of the three engine operating modes studied, the odor intensities and eye irritation observed by the human panel were lowest at the 1200 RPM-1/4 load condition. It is believed at this time that the eye irritation from the exhaust can be accounted for by the formaldehyde and acrolein found in the exhaust. There is no clear-cut correlation, however, between the concentrations of these aldehydes and the odor differences observed.##

03544

B. E. Saltzman N. Gilbert

MICRODETERMINATION OF OZONE IN SMOG MIXTURES (NITROGEN DIOXIDE EQUIVALENT METHOD). Am. Ind. Hyg. Assoc. J. 20, 379-86, Oct. 1959.

A new method has been presented for conveniently and specifically determining low concentrations of ozone in polluted air, even in the presence of large amounts of other commonly occurring oxidizing or reducing gases. Ozone was stoichiometrically converted to (and determined as) nitrogen dioxide, by addition of controlled amounts of gaseous nitric oxide to the sample air stream and allowing a short reaction flow time. Better than 95% conversion was obtained in a convenient apparatus which was developed, when 1 p.p.m. excess nitric oxide and forty seconds reaction time were used. In the short time allowed, oxidation of nitric oxide by air and organic oxidant was negligible. Results for pure ozone were in good agreement with those of an iodide reagent. For synthetic smog oxidant mixtures (generated by the ozone reaction with 1-hexene) the method appeared specific for ozone, whereas the iodide reagent also responded to organic oxidants. (Thus the mixture could be differentiated into two oxidant components by simultaneous application of the two methods.) Reducing gases such as sulfur dioxide and hydrogen sulfide did not appreciably interfere even in one hundred to one ratio to ozone. The method should make possible interesting new data for polluted air. It should be readily adaptable to automatic recording of ozone in smog without interference from associated pollutants. (Author summary)##

03592

S. T. Cuffe

AIR POLLUTANTS FROM POWER PLANTS (TECHNIQUES FOR EVALUATING AIR POLLUTANTS). Arch. Environ. Health 6, 422-7, Mar. 1963. (Presented at the 27th Annual Meeting, Industrial Hygiene Foundation, Pittsburgh, Pa., Oct. 24-25, 1962.)

The objective of the study is to evaluate the emissions of oxides of nitrogen, oxides of sulfur, polynuclear hydrocarbons, total hydrocarbons, total solids, formaldehyde, organic acids, and common metals in the gases emitted from various types of coal-burning power plants which may be useful in establishing the range of atmospheric emissions under various conditions of operation. Determination of the efficiencies of control equipment is also essential for the long-range objective of reducing total air pollution. This paper describes the sampling and analytical techniques used in evaluating the several types of emissions under study.##

03621

03621
M. D. Thomas, J. A. MacLeod, R. C. Robbins, R. C. Goettleman, R. W. Eldridge, L. H. Rogers

AUTOMATIC APPARATUS FOR DETERMINATION OF NITRIC OXIDE AND NITROGEN DIOXIDE IN THE ATMOSPHERE. Anal. Chem. 28, 1810-6, Dec. 1965. (Presented in part, Division of Analytical Chemistry, Symposium on Air Pollution, 130th Meeting, American Chemical Society, Atlantic City, N.J., Sept. 1956.)

Nitric oxide and nitrogen dioxide in the atmosphere can be determined continuously with automatic sampling and recording apparatus. Two special absorbers are employed for absorption of nitrogen dioxide in a modified Griess reagent followed by colorimetric recording. One absorber measures the nitrogen dioxide alone; the other measures nitrogen dioxide plus nitric oxide after the latter has been oxidized by ozone, permanganate, or chlorine dioxide. Concentration limits of the instrument range up to about 1 p.p.m., but they can be considerably extended or reduced. Standard error is about plus or minus 5%. (Author abst*act)##

03727

A. P. Altshuller, S. F. Sleva, A. F. Wartburg

SPECTROPHOTOMETRIC DETERMINATION OF OLEFINS IN CONCENTRATED SULFURIC ACID. Anal. Chem. 32, (8) 946-54, July 1960. (Presented before the Division of Water, Sewage, and Sanitation Chemistry, Symposium on Air Pollution, 136th Meeting, American Chemical Society, Atlantic City, N.J., Sept. 1959.)

A new spectrophotometric method for the determination of small quantities of olefins is based on the absorbance produced in the 300 to 310 millimicron range from their reaction with concentrated sulfuric acid. The procedure is insensitive to ethylene under all conditions studied and to propylene concentrations below 1500 p.p.m. Propyl and higher molecular weight alcohols react to form absorbing products at 300 millimicron. Some higher molecular weight aldehydes, nitrogen dioxide, and sulfur dioxide interfere moderately. The method has been applied to the analysis of a number of two component liquid mixtures and to gas mixtures containing butenes, 1-hexene, or 1-hexene-benzene in air. The experimental evidence favors carbonium ions as the absorbing species. (Author abstract)##

03924

V. A. Tret'yakova

THE DETERMINATION OF 4,4'DIPHENYLMETHANE DUSOCYANATE IN AIR UNDER EXPERIMENTAL CONDITIONS. Hyg. Sanit. 31, (4-6) 73-5, Apr.-June 1966. Rr. (Tr.)
CFSTI, TT 66-51160/4-6

Two methods are suggested for the photometric determination of 4,4-diphenylmethane dusocyanate (DMD). The first method of determination is based on the reaction of DMD with aromatic amines and nitrites for which the sensitivity is 1 microgram in 4.2 ml and the determination error is plus or minus 7%. The second method of determination is based on the reduction of DMD with NO2 ion. In this case the sensitivity is 20 micrograms/5.5 ml for photometric deterination with an FMS-56 instrument, with a mean error of plus or minus 4%; the sensitivity for photometric determinations by the standard series method is 2 microgram/5.5 ml, with an error of plus or minus 10%. DMD vapor is absorbed by acetone when the air is drawn through two absorbing vessels with porous partitions cooled by ice, at a rate of up to 30 1/hr.##

03948

G. Norwitz

A COLORIMETRIC METHOD FOR THE DETERMINATION OF OXIDES OF NITROGEN. Analyst (Cambridge) 91, (1086) 553-8, Sept. 1966.

A method for determining oxides of nitrogen applied to gaseous products derived from initiating compositions is described. The oxides of nitrogen are absorbed from the sample into sulfuric acid, iron (II) sulfate is added and the pink color is measured. The interference effects of a number of gases such as hydrogen sulfide and sulfur dioxide have been investigated. The range of the method is 0.005 to 5% of oxides of nitrogen, calculated as nitrogen dioxide.##

04018

H. Stratmann and M. Buck

MEASUREMENT OF NITROGEN DIOXIDE IN THE ATMOSPHERE. Messung von stickstoffdioxid in der atmosphare. Intern. J. Air Water Pollution 10, (5) 313-26, May 1966.

Up to the present time there has been no standard process for determining nitrogen dioxide in the atmosphere. Saltzman process is suitable both for discontinuous, continuous and recording measurements, according to international experience to date. The chemical reaction mechanism which forms the basis of this process is, however, still so obscure that different interpretations and calculations of the research findings are made. The behaviour of gaseous nitrogen dioxide towards reaction solution in comparison with the calibration of the process with sodium nitrate was investigated. It was found that, contrary to the classical conceptions, 0.5 M of sodium nitrate are not equivalent to 1 M of NO2, nor, contrary to Saltzman's view, are 0.72 M, but 1 M of NO2 corresponds to 1 M of NO2 ions from sodium nitrite. The calibration factor for a calibration function established with sodium nitrite thus has no value different from 1, contrary to previous conceptions. After calculation of the limit of detection and the reproducibility, the disturbing influences of foreign substances were investigated, with special attention to the behaviour of NO-NO2 mixtures. Discontinuous NO2 emission measurements can now be carried out at intervals of 10 min. using a special sampling vessel with an air flow rate of 60 liters/hr. (Author abstract modified)##

04635

W. F. Serat, F. E. Budinger, and P. K. Mueller

TOXICITY EVALUATION OF AIR POLLUTANTS BY USE OF LUMINESCENT BACTERIA. Atmos. Environ. (London) 1, (1) 21-32, Jan. 1967. (Presented at the Seventh Confreence of Methods in Air Pollution Studies, Los Angeles, Calif., Jan. 25-26, 1965.)

Cells of a species of luminescent bacteria were treated with a gas stream containing products formed by the photochemical oxidation of cis-2-butene and NO. Luminescence and viability decreased with the time of irradiation of reactants. The rate of luminescence decrease was dependent on the ratio of the initial concentrations of cis-2-butene and NO with a ratio of giving the most rapid loss. Known photochemical oxidation products, ozone, NO2, formaldehyde, acetaldehyde, and PAN were examined individually. Aldehydes did not appear to contribute to the decrease in luminescence but ozone and PAN did. Although NO2 alone up to 0.5 ppm produced no decrease, it may contribute to the luminescence loss in the total irradiation mixture. The total oxidant concentration produced upon irradiation gave luminescence decreases which were matched by comparable concentrations of pure ozone. However, this does not imply that luminescence losses caused by photochemical oxidants are due only to ozone. A possible mechanism of the toxic effect and the interpretation of this bioassay in relation to other organisms are briefly discussed. (Author abstract)##

04643

J. T. Shaw

THE MEASUREMENT OF NITROGEN DIOXIDE IN THE AIR. Atmos. Environ. 1, (2) 81-5, Mar. 1967.

A method for determining whether an electrolytic generator gives a quantitative output of NO2 is described. The Hersch electrolytic NO2 generator was used to provide accurately known weights of NO2 and thus to evaluate a calibration factor for Saltzman's colorimetric reagent used for the determination of the gas. The test confirms the value of 0.72 for the calibration factor. An assertion that the calibration factor is dependent on the concentration of nitrogen dioxide sampled, is reexamined and dismissed, the observations being re-interpreted on a simple basis. (Author abstract modified)##

04696

M. E. Morrison and W. H. Corcoran

OPTIMUM CONDITIONS AND VARIABILITY IN USE OF PULSED VOLTAGE IN GAS-CHROMATOGRAPHIC DETERMINATION OF PARTS-PER-MILLION QUANTITIES OF NITROGEN DIOXIDE. Anal. Chem. 39, 255-8, Feb. 1967.

The electron-capture detector has been shown to be very sensitive to compounds with high affinities for free electrons. Because of the relatively high electronegativity of the nitrogen oxides, an electron-capture detector was studied for its applicability in the detection of parts-per-million quantities of nitrogen dioxide. With the objective of analyzing NO2 at concentrations below 1 ppm a plane-parallel electron-capture detector was designed and built. The effects of temperature, flow rate, size of tritium source, voltage, and the means of applying voltage to the plane-parallel detector were studied. In the study of the methods for applying voltage, direct current and pulse modes were used. A Loenco 15A gas chromatograph with a Loenco 15B electrometer was used in the study. The plane-parallel detector which was built was similar to one described by Lovelock. A source of approximately 180 mc of tritium was used. A conditioned Fluoropak 80 column was operated at 22 C. Argon was used as both a scavenger and carrier gas. In the study of the optimum conditions of operation, 0.5-cc samples of nitrogen containing 88.3 ppm of NO2 were used. For the d.c. method of operation with the plane-parallel detector, the most sensitive response was with a carrier flow of 10 cc per min of argon, a scavenger flow of 10 cc per min, and a detector potential of 4.5 v. The plane-parallel design required a lower potential and scavenger flow for optimum response in comparison to the opposed-flow Barber-Colman detector i.e. 4.5 vs. 33 v and 10 vs. 85 cc per min., respectively. With the pulse mode of operation, the response of the plane-parallel detector was relatively independent of voltage between 10 and 50 v. The sensitivity of the electron-capture detector operated in the pulse mode was increased approximately fourfold in the concentration region from 1 to 10 ppm NO2 when the temperature was decreased from 200 to 25 C, but the effect was not linear with temperature. In fact, nearly all of the increase in sensitivity was obtained in the range from 90 to 25 C. An increase in the strength of the tritium source did increase the response for a given quantity of NO2, but the noise level was increased in the same proportion. Thus, the absolute sensitivity was not a function of source strength as long as a reasonable background current could be obtained. The chromatographic determinations compared very favorably with chemical techniques for the analysis of NO2.##

04715

S. L. Sachdev, J. W. Robinson, and P. W. West

DETERMINATION OF VANADIUM BY ATOMIC ABSORPTION SPECTROMETRY. Anal. Chim. Acta 37, 12-9, 1967. (Presented at the Meeting of the Society for Applied Spectroscopy, Denver, Colo., Sept. 1965.)

Methods for the determination of vanadium, in the range of 0.5-100 mg/1, by atomic absorption spectroscopy in an oxy-acetylene as well as in a nitrous oxide-acetylene flame are presented. For use with oxy-acetylene flames, V is extracted as vanadium cupferrate into a mixture of methyl isobutyl ketone and oleic acid and the organic phase is aspirated to the flame. The sensitivity is 0.7 mg/1 of V in the organic phase. An extraction procedure eliminates a large number of potential interferences from cations as well as anions. Of the following ions that may be extracted along with V in this procedure: Sb3(plus), Cu2(plus), WO4(2minus), Bi(3plus), Th(4plus), MoO4(2minus), UO2(2plus), Sn(4plus) Ti(4plus), Fe(3plus), Zr(4plus), none were found to interfere with the determination; excess cupferron must be added if Fe(3plus), Sb(3plus) or Zr(4plus) are present because they are preferentially complexed under the conditions. For nitrous oxide-acetylene flames, an aqueous solution of V is aspirated directly, the sensitivity being improved by use of methyl isobutyl ketone, the addition of Al(3plus) and diethylene glycol diethyl ether. Elimination of potential interferences is discussed.##

04716

S. L. Sachdev, J. W. Robinson, and P. W. West

EFFECT OF MIXED ORGANIC SOLVENTS ON ATOMIC ABSORPTION SPECTROPHOTOMETRY OF REFRACTORY METALS. Anal. Chim. Acta 37, 156-63, 1967.

The effect of various organic solvents on the absorption signal of vanadium in fuel-rich oxy-acetylene flames and nitrous oxide-acetylene flames was investigated. The absorption of the 3183.9 A line of V was greatly enhanced by the use of various mixed organic solvents when fed to oxy-acetylene flames. In general, the solvents' effect was in the following order: Propanol-2 greater than ethanol which was greater than methanol. Results showed that absorption was maximum in highly reducing flames and increased as the concentration of organic solvent increased. Maximum absorption was observed when the solution contained more than 70% of the respective solvents. In the case of nitrous oxide-acetylene flame, the addition of diethylene glycol (about 8% in the final solution), and similar compounds, to the aqueous solution of V increased the absorption by about 50%.##

04796

J. E. Sigsby, Jr., L. J. Lage, T. Bellar, and M. L. Eisele

CHEMICAL METHODOLOGY IN AUTO EXHAUST STUDIES. Preprint. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

A major auto exhaust research project requires extensive chemical analytical support. Such compounds as NO, NO2, acrolein, and the individual hydrocarbons and such classes of compounds as olefins and oxidants are determined routinely. Sampling schedules and conditions are important in the over-all program. This paper describes the specific analyses and the general laboratory program that provide the greatest amount of significant chemical information. The procedures discussed include IR spectroscopy, wet chemical analysis and gas chromatography. Wet chemical analyses are made for NO2, NO, four-carbon and higher olefins, acrolein, and formaldehyde. All samples for wet chemical analysis are taken with bubblers. A Beckman Spectrophotometer, Model DU, is used to determine absorbance. For hydrocarbon analysis the gas chromatograph used is a modified three-stage instrument. The first and second stages are operated in series, using thermal conductivity detectors and helium carrier gas. The third stage operates separately with a flame ionization detector and a silica gel column to determine the higher hydrocarbons. The first two stages are used in conjunction with a double trapping system to determine four-carbon and higher materials. The utilization of this array of testing methods and equipment requires careful planning, if each experiment is to yield maximum information. On one occasion 50 samples were analyzed in a 4-hour period; this is more than one sample every five minutes, and is typical of the quantity of data that may be obtained if necessary. Normally, the reproducibility of the chemical results is better than 10%.##

04857

G. Dimitriades

DETERMINATION OF NITROGEN OXIDES IN AUTO EXHAUST. J. Air Pollution Control Assoc. 17, (4) 238-43, Apr. 1967.

A new procedure for determining nitrogen oxides in automobile exhaust has been developed. The new procedure was included in a Bureau of Mines comparative study that aimed at evaluating various widely used methods for determing NOx in auto exhaust. The methods included in the evaluation study follow: (1) Static oxidation in tank (ST method). The method involves oxidation of NO in residence with O2 in a stainless steel tank. (2) Bureau of Mines method (BM method). The method involves application of the ST procedure in exhaust samples from which the gydrocarbons have been revoced by combustion over catalyst. (3) Chevron Research method (CR method), as described in the literature. (4) Phenoldisulfonic acid method (PDS method), as described in the literature. The principal objective of this study was to generate experiemental evidence which would lead to defining an optimum procedure for converting NO, present in exhaust gas, into NO2; this conversion is desired so that the total of NO + NO2 can be determined quantitatively in the form of NO2. In pursuing this objective, the procedures prescribed by the foregoing methods were comparatively tested. The results indicated that all four methods are subject to error, the extent of which depends on the conditions employed. The BM method was superior from the standpoint of accuracy because it was less affected by interferences due to hydrocarbon-NO2 reactions. (Author abstract)##

04880

B. C. Newbury

THE USE OF THE CORRELATION SPECTROMETER IN THE STUDY AND CONTROL OF AIR POLLUTION. Preprint. (Presented at the Air and Water Pollution Conference, Sacramento, Calif., Feb. 2-3, 1967.)

The Barringer Correlation Spectrometer is a highly specific instrument offering great advantages in pollutant monitoring: (1) It is a physical measurement and does not require frequent renewal of reagent solutions; (2) It can operate through a wide range of temperature: it does not require constant temperature enclosures, or even protection from freezing; (3) It requires no pumps or valves. The passive model requires power only for the electronics and remote operation using solar cells if possible; and (4) The basic instrument is suitable for a large number of compounds, reducing drastically, the spare parts and expertise required, in comparison with the usual range of unrelated instruments. The Barringer Tape Sampler is a modular sampler of improved design and with a very flexible timing control unit. The sequential sampler module will be additive for extended sampling schedules.##

04881

A. P. Barringer

NEW INSTRUMENTATION AND TECHNIQUES FOR POLLUTION MONITORING. Preprint. (Presented at the Air and Water Pollution Conference, Sacramento, Calif., Feb. 2-3, 1967.)

Correlation spectrometers utilize an internal memory of the spectrum which it is desired to detect. Real time correlation is carried out against the spectrum of the incoming radiation. The first of these devices uses a conventional grating spectrometer. A photographic replica of the spectrum of the gas being detected is installed in the position normally occupied by the slit of a dispersive spectrometer. A spectrometer is used to make the replica mask, by exposure through a cell of the gas, matching exactly the dispersion and aberration characteristics of the spectrometer. The unknown spectra of the incident light is caused to vibrate across the correlation mask, by using a refractor plate oscillating in a rotary fashion to displace the entrance slit image from side to side. Phase locked detection of the output of the photo-multiplier is carried out in synchronism with the oscillations of the refractor plate. Integration of the synchronous detection can be made over a period varying from a fraction of a second to several seconds. A telescope may be incorporated in the instrument. Alternative means may be employed for oscillating the slit image such as a high stability tuning fork and dual refractor plate assembly. An instrument of this type has been programed for sulfur dioxide detection. It is capable of detecting concentrations as low as ten parts per billion over a one hundred meter pathlength. It is highly specific for sulfur dioxide having an excellent immunity ot interferences. Operation is in the ultraviolet region between 2,900 and 3,150 Angstroms where there is sufficient solar spectral radiant flux penetrating the atmosphere to enable the equipment to function passively using natural daylight. An automatic gain control system operates on the average DC value of the photomultiplier output. The AC signal under these conditions is directly proportional to the percentage modulation caused by sulfur dioxide.##

04900

M. Frossard, R. G. Rinker, and W. H. Corcoran

DETERMINATION OF SMALL QUANTITIES OF NITRIC OXIDE AND NITROGEN DIOXIDE IN NITROGEN BY GAS CHROMATOGRAPHY. Am. Soc. Testing Mater. Spec. Tech. Publ. 352, 56-9, 1964. (Presented at the Symposium on Air Pollution Measurement Methods.)

Studies were made on the determination of nitric oxide (NO) and nitrogen dioxide (NO2) present at less than 5000 ppm by volume in nitrogen. The work was a continuation of previous studies on the quantitative analysis of small amounts of nitric oxide in nitrogen by gas chromatography using a silica gel column. The nature of the results suggests that NO and NO2 are irreversibly adsorbed in small quantities of silica gel. This strong adsorption, separate from a physical or van der Waals adsorption, forms a basis for separation of small amounts of NO and NO2 subsequent to an initial conditioning of the silica gel with these oxides of nitrogen (N 2). (Authors' abstract)##

04915

R. R. Sakaida, R. G. Rinker, R. F. Cuffel, and W. H. Corcoran

DETERMINATION OF NITRIC OXIDE IN A NITRIC OXIDE - NITROGEN SYSTEM BY GAS CHROMATOGRAPHY. Anal. Chem. 33, (1) 32-4, Jan. 1961.

Data are presented to show the precision in the determination by gas chromatography of nitric oxide present to the extent of 0.404% by volume in a nitric oxide-nitrogen mixture. Silica gel was used as a packing in an 8-foot column, and a dual-thermistor thermal conductivity cell was used as a sensing element. The 3-sigma limit of standard deviation for a set of data containing effectively 90 individual measurements was about + or - 4%. The separation of the nitric oxide was affected by the conditioning of the column with NO2 which was strongly adsorbed on the silica gel. The adsorbed NO2 probably formed a weak bond with the NO in the gas sample to give adsorbed N2O3 which readily decomposed to give up NO, but with fractionation from the N2. The techniques permit the determination of NO at concentrations from at least 1000 to 10,000 p.p.m. in N2 for an expenditure of time of less than 20 minutes per determination. It is believed that the procedure could readily be extended to as low as 50 p.p.m. of NO in N2.##

04973

P. L. Magill

TECHNIQUES EMPLOYED IN THE ANALYSIS OF LOS ANGELES SMOG. Proc. Natl. Air Pollution Symp., 1st, Pasadena, Calif., 1949. pp. 61-8.

An analysis of smog was undertaken with the major objectives being the determination of the materials responsible for the reduction of visibility and those responsible for eye irritation. The instruments and methods used for collecting particulate and gaseous matter from the atmosphere are described. A new method for semi-quantitative analysis of samples by proton bombardment is explained. A tabular summary of the components of Los Angeles smog is provided. The effects of particulate matter on visibility are described and a simulation experiment is mentioned which shows eye irritation to be the result of the synergistic effect of several substances.##

05070

R. P. Lewis

MODIFICATION OF GAS SAMPLING APPARATUS FOR USE IN SHORT-TERM AIR POLLUTION STUDIES . J. Air Pollution Control Assoc. 14, (9) 370-1, Sept. 1964.

Details describing modifications to the gas sampling apparatus developed and used by the U. S. P. H. S., Division of Air Pollution, are given. These modifications have resulted in the following improvements: lighter weight, reduced breakage, reduced expense, and increased ease or operation. The unit is self-contained, can be shipped and handled easily, and can be operated by one man. (Author summary)##

05078

E. R. Kuczynski

EFFECTS OF GASEOUS AIR POLLUTANTS ON THE RESPONSE OF THE THOMAS SO 2 AUTOMETER. Environ. Sci. Technol. 1, (1) 68-73, Jan. 1967.

A study was made of the quantitative response of the Thomas SO2 autometer to gases that might coexist with SO2 as air pollutants. These gases included NO2, NO, HC1, CL2, NH3 , and HF. The gas mixtures were prepared dynamically at the ppm level by a flow mexing method to a high degree of accuracy. Syringe pumps were used to add small quantities of pure gases to a large vol. air stream. The effects of NO2, NO, and HF on the SO2 reading were small, but HC1, NH3, and CL2 gave significant response. (Author abstract)##

05081

G. Norwitz

SPECTROPHOTOMETRIC DETERMINATION OF TOTAL OXIDES OF NITROGEN BY FERROUS SULFATE REACTION . Army Frankford Arsenal, Philadelphia, Pa. (Test Rept. No. T66-2-1.) Nov. 1965. 33 pp.

An accurate and rapid method is proposed for the determination of total oxides of nitrogen in gases from initiators and other explosive devices. Total oxides of nitrogen include nitric oxide, nitrogen dioxide, nitrogen trioxide, nitrogen tetroxide and nitrogen pentoxide. It is frequently customary to determine the total of these oxides because of the similarity in their toxicity, mode of formation, and the ease with which they are converted to each other in equilibrium reactions. In the proposed method the oxides are treated with air and are absorbed into sulfuric acid (10 to 3). Ferrous sulfate reagent is then added and the pink color is measured. It is not necessary that the air oxidize nitric oxide completely. It is shown that nitrate and nitrite give the same color with the ferrous sulfate reagent. The method was checked by a technique using a modified Hamilton syringe, together with a special gas bulb and laboratory cylinders of nitric oxide and nitrogen dioxide. (Author abstract)##

05170

F. G. Rounds, and H. W. Pearsall

DIESEL EXHAUST ODOR (ITS EVALUATION AND RELATION TO EXHAUST GAS COMPOSITION. Vehicle Emissions (Selected SAE Papers) 6, 45-

69, 1964. (Presented at the National Diesel Engine Meeting, Society of Automotive Engineers, Chicago, Ill., Nov. 1-2, 1956, Paper No. 863.)

Techniques, based on panel estimates, were developed for evaluating the odor and irritation intensities of undiluted Diesel engine exhaust gases or of various dilutions of these gases in air. Along with the estimates, chemical analyses were made to determine the concentrations of total aldehydes, formaldehyde, and oxides of nitrogen. Statistically significant correlations were found between odor or irritation intensity estimates and the analytical data, but these correlations were too weak to permit accurate prediction of odor or irritation from chemical analyses. The effects of some engine variables on Diesel odor were studied. Possible means of reducing Diesel odor are discussed. Limited studies indicated that engine load has a pronounced effect on exhaust odor and irritation intensity. Engine make, engine speed, engine condition, fuel type and lubricating oil type had comparatively little effect.##

05245

L. A. Mokhov, Yu. F. Udalov, and V. S. Khalturin

QUANTITATIVE DETERMINATION OF NITRITES AND OXIDES OF NITROGEN IN PUBLIC HEALTH PRACTICE . Lab. Delo 5, (2) 45-6, 1959.

A procedure is described for the determination of nitrite and nitrogen oxide concentrations with the same precision as with the Griess-Ilosvay reagent. The principle of the method consists in the diazotization of para-aminobenzoic acid in an acid medium by atmospheric oxides of nitrogen or by the nitrous acid produced through the interaction of the nitrites in the acid medium, with formation of a dye by combination with 1-amino-8-naphthol-3, 6-disulfonic acid. For this purpose, para-aminobenzoic acid is dissolved in water and acidified with hydrochloric acid; in the presence of nitrites or oxides of nitrogen it is diazotized, with formation of a diazonium salt, which with 1-amino-8-naphthol-3, 6-disulfonic acid gives a stable crimson color. The sensitivity of the method is 0.001 mg/1, the prescision of the determination 0.0005 mg; it may be used for the quantitative determination of nitrogen oxides in the air of industrial plants, or for determination of nitrites in water and meat.

05299

M. Katz

STANDARDIZATION OF METHODS OF MEASUREMENT OF AIR QUALITY IN MEMBER COUNTRIES . Preprint. (1963)

Measurement methods for dust fall, suspended particulates, sulfur dioxide, sulfur trioxide, sulfuric acid, nitrogen oxides, ozone or oxidants, and hydrocarbons are reviewed. Standardization of techniques and methods of reporting data is a prerequisite for international exchange of information and for further co-operative research in order to establish a sound basis for the control of air pollution.

05322

MONITORING OF CONTAMINANTS. THE FIRST STEP IN AIR POLLUTION CONTROL. Instrument Development Co., Reston, Va. Feb. 1, 1967. 27 pp.

This paper was prepared in order to contribute to the better understanding of the need for air contaminant monitoring. Included are explanatory remarks on the Clean Air Act of 1963, some histroical considerations on air pollution, lists of sources pollutants, and specifications on air pollution monitoring equipment currently offered by the Instrument Development Company.

05343

Wilson, Donald and Kopcynski, Stanley L.

LABORATORY EXPERIENCES IN ANALYSIS OF NITRIC OXIDE WITH "DICHROMATE" PAPER. J. Air Pollution Control Assoc., 18(3): 160-161, March 1968. 5 refs. (Presented at the 60th Annual Meeting, Air Pollution Control Assoc., Cleveland, Ohio, June 11-16, 1967. Paper No. 67-199.)

The "dichromate" paper developed by Ripley, Clingenpeel, and Hurn was used successfully in our laboratory for conversion of nitric oxide to nitrogen dioxide at concentrations up to the 1-ppm level. When this paper was used for synthetic mixtures with nitric oxide concentrations in the range of 1-3 ppm, the analyses were erratic and values were lower than calculated. After a number of modification of the procedures for preparing and using the impregnated paper, a modification of the "dichromate" paper was achieved that reduced scatter in the NO analysis and improved conversion efficiency. The efficiency and reproducibility of the modified paper are good enough that efficiency factors may be established to correct data obtained over a period of at least 6-hour continuous use at relative humidities near 50 percent. (Authors' abstract)

05352

Comstock, E. G. and Rue, R. R.

EXPOSURE OF MICE TO NITROGEN DIOXIDE-A CONSTANT PRESSURE SYSTEM. Am. Ind. Hyg. Assoc. J. 22, (1) 33-5, Feb. 1961.

Investigation of the respiratory effects of NO2 requires a methods for delivering a constant known concentration of NO2 into an animal chamber. Continuous delivery of low concentrations of NO2 cannot be accomplished with commonly available gas flow meters. A complaint plastic bag has been incorporated into a closed system designed for exposure of mice to nitrogen dioxide. The plastic bag allows the delivery of a constant concentration of gas at a controlled rate into an animal exposure chamber at nearly constant pressure.

05536

Broering, L. C. Jr., Werner, W. J., Rose, A. H. Jr.

AUTOMOTIVE MASS EMISSION ANALYSIS BY A VARIABLE DILUTION TECHNIQUE. Preprint. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper 67-200.)

The objective of this study was to develop an improved method for measuring engine exhaust, to be used both for compliance testing and for the design and development of new engine-emission-controls. The variable dilution sampling technique was chosen for the system. The operation of this systemincludes collection and simultaneous dilution of the total-exhaust volume with a variable volume of dilution air, such that the total mass flow rate of exhaust gas plus diluent air is constant for a given unit of vehicle operation. Measurement of contaminant concentration in the exhaust-diluent air mixture provides direct measurement of the mass of contaminants discharged per unit operation of the vehicle. For continuous mode mass emission measurements, samples are withdrawn continuously after the sample pump. Carbon monoxide, carbon dioxide, hydrocarbons, and oxides of nitrogen are measured by the standard exhaust measurement techniques. The practical capabilities of the variable dilution system to measure auto exhaust emissions during cyclic operation, were evaluated by comparing the mass-emission levels indicated by this system to those obtained with the proportional sampler. Toe determine the response characteristics of the system under continuous sampling conditions, known quantities of butane were injected at the inlet of the sampling system, and the reqponse of the hydrocarbon (NDIR) instrument was recorded. The redponse time of the total system, including that attributable to the analytical instruments, compared favorably to that obtained with the instrument train specified in both the current Federal and the California Exhaust Emission Standard Procedures. In summary, the variable dilution sampling technique possesses 2 distinct advantages over present emission testing procedures: (1) The technique is simple, practical, and accurate for the direct measurement of vehicle-exhaust mass emissions. (2) The rapid and highly sensitive response characteristics of the system to changes in mode mass-emission levels establish its usefulness as a design and development tool.

05548

Lewis, R. J.

FIELD APPLICATION OF DIFFUSION TUBES FOR DYNAMIC CALIBRATIONS. Preprint. (Presented at the 60th Annual Meeting Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper 67-197.)

Simple, inexpensive environmental control systems which were developed for the field use of diffusion tubes to supply a stable, accurate source of calibration gas for sulfur dioxide, and oxides of nitrogen continuous gas analyzers are described. The results of six months field experiences are presented with comments on and examples of the reliability and utility of the tube system as a calibration technique.

05572

Scott, W. E. and E. R. Stephens

A SCIENTIFIC APPROACH TO THE PROBLEM. Proc. Symp. Cleaner Air Urban Areas, Philadelphia, Pa., pp. 24-35 (1956)

Chemical reactions that take place in a polluted atmosphere produce substances that lend smog its eye-irritating, crop-damaging, visibility-lowering characteristics. The authors relate how, in an effort to identify these reactions and substances, the staff devised the long-path (up to 500 meters) infrared absorption cell. They describe the construction of the cell, and how it is used to detect and "fingerprint" the products of photochemical reactions, both in synthetic and in actual smog. Early work with this new tool was pointed to explaining the characteristic high ozone concentrations of smog, and proceeded from Dr. Haagen-Smit's evidence that nitrogen dioxide reacted with organic compounds in air to produce ozone. They trace the nitrogen dioxide studies that finally led to discovery of Compound X (peroxyacyl nitrite), believed to be the "missing link" in the process of ozone formation in smog. Gasolines and auto exhaust as sources of organic pollutants that take part in NO2 reactions are discussed. They relate their plans for further studies with the infrared cell, and the possibility of applying Los Angeles smog research to other afflicted cities. It may appear that the work reported here is concerned solely with the Los Angeles problem. This is partly true because there air pollution problems in some cities which involve pollutants and weather conditions entirely different from those of Los Angeles. On the other hand, however, many large cities do have pollution sources of the same kind as Los Angeles: power plants, refineries and other industry, incinerators, automobiles, etc. The results of studies of reactions of pollutants from these sources are valid regardless of the city. Weather conditions and topography in the Los Angeles area are such that the products of reactions in the atmosphere frequently accumulate and result in damage and irritation. While conditions for the accumulation of these products occur less frequently in other cities, nevertheless they do occur and the resulting smog is objectionable and costly. With an inversion and no wind, we have a good trap for pollutants from these sources, and as good a chance of having smog as Los Angeles. Plant damage is reported in areas surrounding most large cities of the world. Los Angeles studies show that there are other pollutants besides coal smoke and SO2 that may be objectionable, especially in and around large cities.##

05586

H. M. Benedict and W. H. Breen

THE USE OF WEEDS AS A MEANS OF EVALUATING VEGETATION DAMAGE CAUSED BY AIR POLLUTION. Proc. Natl. Air Pollution Symp., 3rd, Pasadena, Calif., 177-90 (1955)

This paper presents the results of fumigations of ten species of weeds which occur more or less commonly throughout the United States, by ammonia, chlorine, hydrogen fluoride, hydrogen sulfide, oxides of nitrogen, and sulfur dioxide. Plants of two different ages and growing under two conditions of available soil moisture were fumigated at two concentrations of each compound. The results are recorded as (1) descriptions and photographs of the markings which were produced on each weed by each fumigant; (2) relative resistance of the various weeds to each fumigant. By using these two types of information it is believed that, in an area where air pollution may be causing markings on vegetation, observation of the markings on some of these weeds will lead to identification of the pollutant and consequently determination of the area over which it is spreading in concentrations sufficiently high to mark vegetation. (Author summary)##

05606

A. T. Possano, Jr. and H. B. H. Cooper

PROCEDURE FOR CALIBRATING A CONTINUOUS NO2 ANALYZER. J. Air Pollution Control Assoc. 13 (11), 518-23 (Nov. 1963). (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

A method is described for calibrating a Beckman K1008 portable analyzer, an instrument for the continuous measurement of low concentrations (parts per million by volume) of nitrogen dioxide (NO2) in the atmosphere. The apparatus used, reagent preparation, calibration procedures, and limitations and sources of error have been discussed in detail.##

05609

M. P. Sweeney, D. J. Swartz, G. A. Rost, R. Macphee, and J. Chao

CONTINUOUS MEASUREMENT OF OXIDES OF NITROGEN IN AUTO EXHAUST. J. Air Pollution Control Assoc. 14, (7) 249-54, July 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

A pressurization system for conversion of NO to NO2 is described which is a mobile unit capable of continuous sampling and recording of nitrogen oxides in auto exhausts. NO2 absorbs energy in the near UV and blue regions of the spectrum with sufficient strength so as to make colorimetric determinations practical. In addition, if the measurement is made in the neighborhood of 400 millimicrons (blue), cross interferences from other exhaust gas constituents are virtually eliminated. Isolation of the 350-450 millimicrons region may be readily accomplished using a color filter. The possible difficulties arising out of the equilibrium relationship between N2O4 and 2NO2 are greatly diminished since the expected NO concentration will rarely exceed 6000 ppm. From the conversion relationship: 2NO + O2 = 2NO2 it is seen that the NO2 concentration in ppm will exactly reflect the original NO concentration in the exhaust gas if the oxidation efficiency is 100%. On this basis, with stoichiometric oxygen, equilibrium calculations show that for 1000 ppm NO2, 1% appears as N2O4; for 5000 ppm NO2, 6% appears as N2O4; and for 10,000 ppm NO2, 10% appears as N2O4 (room temp, 1 atm). NO will react with an excess of O2 so that the NO2 concentration as measured will be decreased by a constant dilution ratio which will reduce N2O4 values proportionately. The above analysis was used as the basis for designing a photometer to specifically measure NO2 or oxidized NO in automobile exhaust gas. The sensing instrument is basically a double beam colorimeter which utilizes two voltage regulated tungsten filament sources, two optical cells, and two cadmium sulfide photoconductive detectors. While the colorimeter response is satisfactory, that of the total analyzer system of the prototype must be improved if rapid changes are followed. Potential means for reducing the response time are described.##

05866

R. E. Rostebach and R. G. Kling

NITROGEN DIOXIDE DETECTION USING A COULOMETRIC METHOD. J. Air Pollution Control Assoc. 12 (10), 459-63 (Oct. 1962). (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

The toxic level presence of NO2 in any working area is an industrial hygiene problem, and its unwatned presence in any area may present an air pollution problem. The adaptability of the Mast Model 724 Series Meter for the monitoring of NO2 HAS been demonstrated. The Mast Nitrogen Dioxide Meter is based upon a coulometric system. A chemical solution containing the proper amounts of reagents is pumped into the sensor. The solution flows in a thin film down the electrode support, upon which are wound many turns of a fine platinum wire cathode and a single turn of a platinum wire anode, and is deposited in the waste reservoir. The air sample enters through the air inlets, is drawn into the sensor by way of the narrow annulus where it comes into intimate contact with the solution contained on the electrode support, and exits by means of air pump. The instrument requires only 115-volt, 60-cycle power supply and a small 1.34-volt mercury battery. A battery-operated portable unit was developed for NO2 measurements at locations where an external power supply is not available. Operating characteristics of the microcoulomb sensor are: (1) A fixed dc voltage applied across the sensor cathode and anode; (2) The chemical solution flows over the electrodes at a fixed flow rate (1.25 ml/hr typical for O3 meters and 2.5 ml/hr typical for NO2 meters); (3) The gas sample containing an oxidant to be measured flows through the sensing cell at a fixed flow rate (140 ml/min typical for ground level applications). The response time of a sustained level of 2000 ppm of NO2 is 50% of full reading in 0.2 min, 88% in one min, and full reading response occurs in less than 5 min. The detector recovers in less than 12 sec. after removal of NO2. Recovery down to 20% of an actual concentration reading occurs in less than 60 sec. Full recovery occurs in less than 5 min.##

05952

Ryazanov, V. A.

A SUMMARY OF 1961 STUDIES IN THE FIELD OF LIMITS OF ALLOWABLE CONCENTRATIONS OF ATMOSPHERIC AIR POLLUTANTS. (In: Limits of allowable concentrations of atmospheric pollutants. Book 7.) U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 9, pp. 138-41. (1963). Russ. (Tr.)

The Committee for the Sanitary Protection of Atmospheric Air approved limits of allowable concentrations in the air for the following new substances: furfurol, dimethylformamide and styrol. Furfurol is a heterocyclic aldehyde which is a good solvent for many organic substances used in the preparation of some plastics and a selective solvent for the purification of crude oil lubricants. The threshold of aldehyde odor perception in most sensitive persons was established at 1 mg/cu m. It was determined that 0.05 mg/cu m of furfurol constituted the subthreshold concentration in all the tests employed. Therefore, 0.05 mg/cu m of furfurol was accepted as the maximal single allowable concentration. Styrol is a benzene homologue with one double bond at its side chain. The maximal single allowable concentration of styrol in the atmospheric air was suggested as 0.003 mg/cu m. Dimethylformamide is a colorless liquid having a nauseating herring odor; it is used as a polyacrylnitryl solvent in the synthetic fiber industry known as orlon and nitron. It was recommended that 0.03 mg/cu m be adopted as the limit of allowable single and 24 hour concentration of dimethylformamide vapor in the air, since it proved to be the subthreshold concentration in relation to all the test indexes. The limit of allowable phenol concentration in atmospheric air was set at 0.01 mg/cu m. Rats were exposed to the inhalation of nitrogen dioxide 6 hours daily for 164 days at different dose levels. No maximum allowable concentration was agreed upon.

06050

D F. Adams

OZONE ANALYSIS WITH THE MINI-ADAK II. J. Air Pollution Control Assoc. 13, (2) 88-90, Feb. 1963. (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

The suitability of sodium diphenylaminesulfonate (NaDS), potassium iodide, and phenolphthalein reagents for ozone analysis in a multipurpose, automatic analyzer such as the Mini-Adak II was investigated. The oxidation potential for NaDS is more negative than that for iodine and, therefore, NaDS is believed less susceptible to oxidative interference as a colorimetric reagent. The reagents were prepared along with a mixture of ozone and oxides of nitrogen. The test atmosphere was drawn through a single manifold and thence to two midget impingers in parallel, one containing 10 ml of the neutral KI reagent and the other 10 ml of either the NaDS or phenolphthalin reagent. A second series of comparisons was made between a midget impinger containing neutral KI and the Mini-Adak II utilizing the NaDS or phenolphthalin reagent. Based on the literature and the work herein reported, either the phenolphthalin or NaDS reagents can be used in the Mini-Adak for ozone analysis. Selection of the reagent to be used should be based upon an evaluation of the possible interferences which may be present with ozone in the atmosphere and the relative sensitivities (molar absorbancy) of the two reagents. Either reagent shows only one-fourth as much response to NO2 neutral KI and is therefore superior to KI in this respect. Based on the laboratory study, the phenolphthalin reagent appears somewhat preferable for use in the Mini-Adak. This selection is tentatively made upon the basis of the greater sensitivity (molar absorbancy) of the phenolphthaline which permits the use of a lower Mini-Adak sensitivity range with its attendent reduction in electronic background noise.##

06112

Tada, O.

MEASUREMENT OF AIR POLLUTANTS. Bunseki Kagaku (Japan Analyst) (Tokyo) pp. 110R-7R. 1966. Jap.

Important papers published in Japan Analyst in 1964 and 1965 are summarized. The subject is limited to measurement methods of air pollutants known to be toxic to health. Pollutants from stacks and automobile exhausts are covered, including many cyclic hydrocarbons, aldehydes, sulfur oxides, nitrogen oxides, ozone, carbon monoxide, carbon dioxide, fluorine compounds, hydrogen sulfide, lead compounds, and offensive odors. Various sampling methods are described, especially using filtering with glass wool filters, electric dust collectors, gas absorbers, and portable samplers containing silica gel. The pollutants can be measured by electroconductivity methods, colorimetric measurement recorder, gas chromatographic analysis, electron capturing detector, and hydrogen ion detector. The papers summarized do not include those dealing with industrial or occupational environment or mining.

06279

K. E. Ball

DEVELOPMENT OF AN ATMOSPHERIC MONITORING SYSTEM (FINAL REPT. JUNE 12, 1958-JUNE 30, 1961). (Mine Safety Appliances Co., Pittsburgh, Pa., Research and Engineering Division.) (1961). 45 pp. (Rept. No. MSA 301825.)

Atmospheric monitoring devices sensitized to continuously detect and record toxic and higher concentrations of HF, F2, B5H9, N2H4, NO2 and C1F3 (missile fuels and oxidizers) have been developed and engineered. An ionization type analyzer sensitive to finely divided aerosols is used as the detecting instrument. Various amine and acid reagents are used to convert the oxidizers and fuels respectively to aerosols. Response times are in the order of seconds and a high degree of specificity has been attained. (Author's abstract)##

06284

R. Buscaglia and S. Wallack

FEASIBILITY STUDY OF A MULTIPURPOSE INFRARED PROPELLANT DETECTOR. (Patterson Moos Research Division, Leesona Corp., Jamaica, N.Y.) (ASD Technical Rept. No. 61-382.) (Aug. 1961). 22 pp.

This investigation was concerned with determining the feasibility of developing open-path narrow absorption infrared (NAIR) instrumentation capable of detecting and measuring very low atmospheric concentrations of various toxic propellant vapors. In the course of this program a novel measurement system was conceived, and a laboratory prototype of this system was designed and fabricated. Because of the unique spectral response characteristics of the NAIR detector, it was possible to combine in this one instrument the desirable features of both single and double beam instrumentation. The system was applicable to ethylene oxide, unsymmetrical dimethyl-hydrazine, dinitrogen tetroxide and hydrazine. Tests performed with this prototype instrument demonstrated system feasibility. The measurement sensitivity was, in all cases, within one order of magnitude of that required; in most cases it was substantially better than this. Sensitivity to ethylene oxide exceeded the specified requirements. In addition to demonstrating feasibility and determining sensitivity, these tests also indicated several simple modifications which would substantially reduce noise and thereby improve sensitivity. (Authors' abstract)##

06301L

MECHANISMS OF AIR POLLUTION REACTIONS. (Section VIII of Air Pollution Research Progress Report for Quarter Ended December 31, 1966.) Bureau of Mines, Pittsburgh, Pa., Coal Research Center, 1966, pp. BM/69-BM/76.

The NOx-sensitized photooxidation of 2-methyl-1-butene was investigated. Yields with regard to the reaction production formaldehyde, methyl ethyl ketone, PAN, PPN, nitrates and CO were determined. The study of the NOx-sensitized photooxidation of tagged ethylene in the presence of other hydrocarbons was terminated. Results indicated that (u) the photochemical reactivity of ethylene in mixture with other hydrocarbons varies with change in the mixture composition, and (2) the variation is unpredictable at the present time. (Author summary)##

06338

Magna Corp., Anaheim, Calif., Research and Development Div. (Rept. RED-TDR-63-1136.) (May 1963). 48 pp.

TOXIC VAPOR INDICATORS.
CFSTI, DDC: AD 607046

Results are presented of work performed in the development of thin film sensors for the detection of low concentrations of nitrogen tetroxide and fluorine. The effect of temperature and humidity on the response rates of the films is presented. Responses, in terms of increase in sensor resistance, of several percent per minute have been below 1 pmm. Based upon the results, a laboratory model of a personnel dosimeter for nitrogen tetroxide and fluorine was built and submitted for field tests. (Author abstract)##

06460

M. D. Thomas and J. O. Ivie

SIMULTANEOUS MEASUREMENT OF OZONE AND OXIDES OF NITROGEN.
Preprint. (1960.)

This paper describes a modification of the Griess diazo-reaction method by which ozone can be determined specifically. The gas phase reaction between ozone and nitric oxide to form nitrogen dioxide is extremely rapid. The half-life at 1 ppm is 1.8 seconds and 18 seconds at 0.1 ppm. The corresponding half-lives of the NO2-O3 oxidation are listed at 8 and 80 min. respectively. Evidently NO and ozone cannot coexist in the atmosphere. One compound or the other will disappear rapidly even at concentrations found in polluted air. If ozone is present, it can be determined by adding an excess of NO to a sample of the air, allowing a short time for reaction, then finding the increase in NO2 concentration as compared with the untreated air. For this purpose it is only necessary to add a third identical absorber system to the automatic analyzer for NO and NO2 together with accessory equipment to supply the required NO. NO2 when absorbed in this solution (0.5 sulfanilic acid, 5 percent acetic acid and 50 ppm N-(1 naphthyl)-ethylene) diazotizes the sulfanilic acid and reacts with the coupling reagent to produce an intensely colored red azo dye. The latter is read in a recording colimeter. NO has no effect on the reagent and HNO3 does not interfere except at unrealistically high concentrations. All absorbed nitrites react quantitatively. However NO2, which theoretically should give a 50% yield of nitrous acid, actually gives a 82% yield in fitted glass absorbers or a 90% yield in absorbers with stainless steel spirals. Empirical calibration with known amounts of NO2 is therefore necessary. A diagram of the automatic NO2-NO-O3 analyzer is included.##

06599

K. W. Wilson and H. Buchberg

A CONTROLLED ENVIRONMENT SYSTEM FOR AIR POLLUTION STUDIES.
Preprint. (Presented at the 51st Annual Meeting, Air Pollution Control Association, Philadelphia, Pa., May 25, 1958, Paper No. 58-54.)

The objective of this study was to design, construct, and validate a controlled air environment system with limited capital expenditure which would offer flexibility in the areas of experimentation mentioned and in the further elucidation of design parameters concerned with the simulation of the natural air environment. Four very important areas of experimentation in air pollution are: 1. The determination of the effects resulting from the exposure of humans, animals, plants, and materials to an air environment polluted by different substances in various amounts. The identification of substances from various sources of pollution responsible, directly or indirectly, for various deleterious effects, and the determination of the amounts of these substances that must be removed to prevent or minimize these effects. 3. The evaluation of pollution control measures in terms of the actual effects produced. 4. The investigation of reaction mechanisms in the polluted air environment. The controlled air environment system described was constructed and is being developed. In addition to a discussion of the design features, preliminary experiments utilizing the system are presented.##

06613

B. E. Saltzman

COLORIMETRIC MICRODETERMINATION OF NITROGEN DIOXIDE IN THE ATMOSPHERE. Anal. Chem. 26 (12), 1949-55 (Dec. 1954).

A new specific reagent has been developed and demonstrated to absorb NO2 efficiently in a midget fritted bubbler at levels below 1 ppm. The reagent is a mixture of sulfanilic acid, N-(1-naphthyl)-ethylene-diamine dihydrochloride, and acetic acid. A stable direct color is produced with a sensitivity of a few parts per billion for a 10-minute sample at 0.4 liter per minute. Ozone in fivefold excess and other gases in tenfold excess produce only slight interfering effects; these may be reduced further by means which are described. (Author abstract modified)##

06642

C. F. Ellis

A SUGGESTED PROCEDURE FOR CONVERTING NO IN LOW CONCENTRATIONS TO NO 2 (TECHNICAL NOTE). Intern. J. Air Water Pollution, 8 (5), 297-9 (1964).

A modification of the Saltzman method in making analysis of gases containing low concentrations of NO & NO2 is described. The procedure involves use of fiber glass filter paper on which an oxidizing solution of acidified KMnO4 has been evaporated. This oxidant preparation readily converts NO to NO2 in low concentrations, apparently without loss, permitting the well-known colorimetric determination of O2 to be applied to the determination of NO and NO2 separately. In this test the total concentration of NOx should only range from 1 to 5 ppm. Gases containing higher concentrations of NO and NO2 however, possibly could be handled without a dilution step, but this has not been demonstrated. Inasmuch as the procedure as now defined is limited to low concentrations of NO, automobile exhaust gases must be diluted with nitrogen to an appropriate concentration. Moreover, it is necessary that the dilution be made immediately after the exhaust sample is drawn.##

06832

M. Fugas, and M. Gentilizza

EFFECT OF NO2 ON SO2 DETERMINATION USING PARAROSANILINE. Proc. Intern. Congr. Occupational Health, Vienna, 1966. pp. 385-8.

Among various methods used for the determination of SO2 in the air, the procedure after West and Gaeke involving sampling in sodium tetrachloromercurate and colorimetric determination with pararosaniline has found widest application being the most specific and sensitive method in use. The literature data concerning the extent of NO_2 interference in this method are limited. In this investigation, the interference of NO_2 in the determination of SO_2 was studied in chemical solutions of NO_2^- and SO_3^{--}, in samples of laboratory prepared gas mixtures and in the outdoor atmosphere. Test results indicated that a definite amount of NO_2 interferes in the SO_2 determination decreasing the obtained SO_2 values as follows: by the same absolute amount irrespective of the actual SO_2 concentration; by the same percentage irrespective of the actual SO_2 concentration; by the amount depending on the SO_2/NO_2 ratio. (Author abstract modified)##

06889

Antoshechkin, A. G.

INSTRUMENT FOR DETERMINATIONS OF THE CONCENTRATIONS OF NITROGEN OXIDES AND NITRIC ACID FUMES IN AIR. (Pribor dlya opredeleniya kontsentratsii okislov azota i parov azotnoi kisloty v vozdukhe.) Hyg. Sanit. (Gigiena i Sanit.), 30(2):234-236, Feb. 1965. Translated from Russian.
CFSTI: TT 66-51033

The author designed and tested an instrument for the determination of the concentrations of nitrogen oxides and nitric acid fumes in air. The action of the instrument is based on measurements of the electrical conductivity of a solution obtained by drawing the air with nitrogen oxides through distilled water. The instrument is portable, its design is simple and it can be constructed under laboratory conditions. Its sensitivity is from 0.0003 to 20 mg nitrogen oxides per 1 liter of air. One analysis takes 1 to 2 min. Thirty ml of distilled water is introduced with the syringe into the upper tube and into the vessel. The water cannot leave the vessel because of the valve, and it forms a 1 cm layer between the two electrodes. now the pump is attached and 5 1 of air are drawn in distilled water. Nitrogen oxide from the air combines with water to produce nitrous acid. The higher the concentration of nitrogen oxide in the air, the higher will be the concentration of the HNO_2 solution in the vessel. Since HNO_2, like HNO_3, is a strong electrolyte and completely dissociated to ions in dilute solutions, the electrical conductivity of the solution is proportional to the concentration. The electrodes are fed with a constant voltage from a 4.5V source. In using the instrument, one must remember that interference is caused by gases that are readily soluble in water and produce a strong electrolyte on solution (the sulfuric acid fumes). After suitable graduation, the instrument can also be used for the determination of sulfuric acid fumes in air.##

06911

G. E. Moore, A. F. W. Cole, M. Katz

THE CONCURRENT DETERMINATION OF SULFUR DIOXIDE AND NITROGEN DIOXIDE IN THE ATMOSPHERE. J. Air Pollution Control Assoc. (1), 25-8 (May 1967). (Presented at the 49th Annual Meeting, Air Pollution Control Association, Buffalo, N.Y., May 20-24, 1956.)

Concurrent determinations of SO2 by the conductimetric and colorimetric methods, and simultaneous determination of NO2 by the Saltzman colorimetric method were discussed. Conductimetric determinations yielded consistently higher values for sulfur dioxide than the colorimetric method based on the chromogenic reaction of fuchsin, formaldehyde and sulfite. These differences may be accounted for, in part, by the presence of nitrogen dioxide in the atmosphere which reacts with the fuchsin reagent to lower the colorimetric sulfur dioxide value. The nitrogen dioxide concentration levels of the atmosphere fluctuate in a manner similar to those of sulfur dioxide and are somewhat lower in magnitude than the conductimetric sulfur dioxide levels. When the fuchsin values are corrected for the effect of nitrogen dioxide, the colorimetric sulfur dioxide levels are in fairly close agreement with those estimated by the conductimetric method.##

06983

N. A. Poulos

AMPEROMETRIC PROPELLANT-COMPONENT DETECTOR. Olin Mathieson Chemical Corp., New Haven, Conn., Contract No. AF 33(600)-39311, Project No. 7165, Task No. 71386, ASD Technical Rept. No. 61-154, 39p., May 1961. 19 refs.
CFSTI/DDC: AD 265614

The data obtained in production of an improved multipurpose detector capable of measuring low airborne concentrations of nitrogen tetroxide (N2O4), ozone (O3), hydrazine (N2H4), unsymmetrical dimethylhydrazine (UDMH), and hydrogen fluoride (HF) is presented. The concept of "forward and reverse polarization" was applied and considerable specificity was obtained of 100 microamperes per part per million of nitrogen tetroxide, 52 microamperes per part per million of ozone, 40 microamperes per part per million of hydrazine, and 20 microamperes per part per million of unsymmetrical dimethylhydrazine. (Author's abstract)##

07379

R. Kano

OZONE. Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc.) 2(1):54-59, 1964. 11 refs.

The methods of production, toxic nature, and methods of detection of ozone are described. The Denshi Ozonizer No. 1 is illustrated in which oxygen or air is passed between the dielectric plates and a silent discharge by high voltage a.c. produces ozone. The ozone concentration varies according to humidity and temperature of the air, low temperature and humidity being favorable for effective utilization of the ozone. Part of the toxic character of ozone comes from the presence of nitrogen oxide as an impurity. The maximum allowable concentration of each in its pure state is 20 ppm but when mixed, 1 ppm is the maximum. Uses of ozone for air cleaning, oxidation of organic compounds, sterilization, water cleaning, deodorization, etc. are covered. Ozone detection methods are divided into chemical and physical methods. The physical method is more convenient and fast. Usually the odor of ozone permits its detection before much harm to the human body can occur.##

07391

H. Miyazaki, K. Ui, H. Ando

INVESTIGATION OF TEXT METHODS OF S-OXIDES AND N-OXIDES IN THE ATMOSPHERE. Text in Japanese. J. Japan Petrol. Inst. (Tokyo), 9(3):214-216, Mar. 1966. 10 refs.

The methods investigated are the electrical conductivity method, rosaniline method, and Saltzman method. Drawbacks to the electrical conductivity method are that SO_2 and SO_3 cannot be measured separately and that H_2S, mercaptans, and other elements interfere with measurement. In addition, the electrical conductivity of the absorbing liquid depends on the temperature. The rosaniline method is used only for SO_2. Considerations in using this method consist of the speed of absorption of the air tested, the shape of the absorber, absorption efficiency, and maintenance of the absorption liquid. Impingers and air washing bottles are also required. The absorption of test air depends on the celocity and on the shape of the bottle; absorption efficiency of the absorption liquid was good, indicating the need for only one absorption tube. Data obtained by sue of both electrical conductivity and rosaniline methods were in good agreement with each other. As for the Saltzman method for N-oxides, the absorption efficiency was found to depend on the speed of absorption and on the type of absorption tube used. It is difficult to make a perfect collection of NO_2 by the Saltzman method. The hourly variation of NO_2 concentration in Yokohama is graphed; it reached a peak of 0.05 ppm between 9 and 10 A.M. which is much less than the corresponding SO_2 concentration.##

07401

Suzuki, S.

POTENTIAL AUTOMATIC DETECTOR OF SMALL AMOUNTS OF OXIDIZING GAS USING POTASSIUM IODIDE AS A REACTION INDICATOR (I). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 2(3):19-29, 1965. 7 refs.

The detector described consists of two parts: the measuring section and the recording part. The efficiency of the measuring part was determined by a potentiometer which measured the relation between the iodine concentration and electric potential which are proportional. There was difficulty in obtaining good repeatability values; the problem is discussed in some detail. The efficiency of the automatic recording equipment was then tested. A wiring diagram of the apparatus is included. The relation between resistance change in the wire and deflection of the recorder is graphed. As for operating procedure, the effects of potential stability, bubbling, and ultraviolet rays were investigated. Graphs illustrate that initial potential stability in potassium iodide is difficult to reach but once obtained, the stability will remain constant during changes in potassium iodide. Other effects noted were that bubbling affects the voltage and the effect of ultraviolet rays is great. The detector was used for NO2, ozone, radioactive iodine, and other gases. The process and methods of examination are described in detail.##

07482

Kanno, S.

DETERMINATION OF GASEOUS AIR POLLUTANTS. Text in Japanese. J. Jap. Petrol. Inst. (Tokyo), 7(2):92-96, Feb. 1964. 6 refs.

The determination of sulfur oxides and nitrogen oxides in smoke and in air are covered. SO2 in smoke is measured colorimetrically or by detection tube. Two methods are described: one for measuring pollutants after the combustion of coal or heavy oil or for gases mixed with NO2 and the other for mixtures of SO2 and SO3. Procedures are given for making the test liquid (absorption liquid) and for exact measurement for each method. The detection tube is illustrated briefly. The absorption tube method is not sufficient for NO2 detection. A method of almost perfect collecting efficiency which is used in the Kanagawa Prefecture Public Health Laboratories is described. The absorber is composed of a mixture of NaOH and butanol. For SO2 and SO3 measurement, the electric conductivity method and barium molybdate method are illustrated. The rosanaline method is used as well as an alkali filter paper method. The latter is superior to the widely used PbO2 method in that reagent quality does not affect the measured value and the collecting efficiency does not depend on temperature and humidity. ##

07540

C. O. Peterson, Jr., W. V. Dailey, W. G. Amrhein

APPLYING NON-DISPERSIVE INFRARED TO ANALYZE POLLUTED STACK GASES. Instr. Technol., 14(8):45-48, Aug. 1967. 3 refs.

The toxic and reactive properties that make some air pollutants difficult to analyze in the parts-per-million range are the properties that make it important to measure these effluents accurately. The operation of nondispersive infrared analyzers with a positive filtering type sensitization is reviewed. The method of sensitizing an instrument uses a negative filtering-type sensitization for nitrogen dioxide with a non-dispersive infrared analyzer. In the conventional method, nitrogen dioxide is used to sensitize the comparison cell and detector. However, it was found that it could not be used because of its reactivity. Propylene and vinyl chloride were satisfactory because they have strong adsorption bands at 6.2 microns. Acetone was used to equalize the infrared adsorption by water vapor in both cells. By negative filtering-type sensitization is was possible to desensitize water vapor response although the single-beam (positive filtering) response to water vapor was approximately four times that of nitrogen dioxide.##

07687

Young, Robert A.

MEASUREMENT OF NITRIC OXIDE IN THE EARTH'S ATMOSPHERE. Stanford Research Inst., Menlo Park, Calif., Contract No. DA-49-146-XZ-112, Project No. DASA-1887, SRI Project No. PAU-3895, 34p., March 23, 1967.
CFSTI, DDC: AD 649829

Recent fluorescent nitric oxide dayglow measurements have indicated that the concentration of NO is approximately 100 times larger than previously supposed. This result has necessitated a drastic revision of the models for NO production and loss and re-evaluation of the interaction of Lyman-alpha radiation from the sun with NO to create the ionization in the D-region. It is obviously extremely important to verify the fluorescent measurements by an entirely independent means. Status is described of a nitric oxide detector that is being developed for use in the lower ionosphere. The sensor, which operates by selective photoionization of nitric oxide, was essentially completed. The associated electronics were designed. The mechanical components were designed and partially completed.

07838

Dimitriades, Basil

METHODOLOGY IN AIR POLLUTION STUDIES USING IRRADIATION CHAMBERS. J. Air Pollution Control Assoc., 17(7):460-466, July 1967. 12 refs.

Experimentation in large irradiation chambers has been useful in providing insight into the chemistry of the photochemical smog formation problem. Initial efforts to reproduce the atmoshperic phenomena artifically at controllable scale were successful in that gross atmospheric smog symptoms were observed in irradiation chambers. However, as the experimentation and evidence produced were becoming more elaborate, the question arose as to how much one could rely on chemical data in understanding and interpreting atmospheric phenomena. The question becomes highly pertinent in view of the difference in concentration levels between atmosphere and chamber work. This issue was discussed during recent Amercian Chemical Society meetings, and the conclusions from presnetations and discussions were as follows: (1) There is qualitative agreement between chamber data and atmospheric data wherever comparison is feasible. (2) There is need for more precise chamber work at concentration levels more nearly equal to those in the atmosphere. Experimentation in chambers under typical atmospheric conditions presents some special problems associated with the chamber design and chemical analysis. Chamber methodology has been the focus of considerable research effort, and it appears to be an important factor affecting further progress in air pollution research. This paper describes methods and techniques used at the Bartlesville Petroleum Research Center. (Author's abstract)

07857

F. H. Davis

A REVIEW OF PHYSICOCHEMICAL METHODS FOR NITROGEN, OXYGEN, AND NITRIC OXIDE MEASUREMENTS. Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio, Research and Technology Div.,
CFSTI/DDC: AD 648039
Project No. 1426, Task No. 142610, Tech. Rept. AFFDL-TR-66-71, 43p., Aug. 1966. 164 refs.
CFSTI/DDC: AFFDL-TR-648039

Several of the physicochemical methods used within approximately the last 15 years for research studies performed with molecular nitrogen, atomic nitrogen, molecular oxygen, atomic oxygen and nitric oxide are summarized. Several of the techniques used are: modified conventional spectroscopic techniques, emission and absorption; electron-beam probe studies; flash photolysis (NO2, O3, Cl-oxide decomposition, formation of vibrationally excited O2); shock tube studies (dissociation of O2, indirect measurement of recombination rates at high temperature); flame reaction studies (approach to thermal equilibrum of flame gases measured by photometric or mass-spectrometric methods); modified Wood-Bonhoeffer experiments (fast-flow studies utilizing the air after-glow, catalytic probes, or Wrede-Harteck gauges to measure O-atom concentration); photolysis techniques (Hg-sensitized photolysis of nitrous oxide, low concentration photolysis of nitrogen dioxide); and mass-spectrometer studies (fast reactions by time-of-flight mass spectrometry studies of discharged oxygen by modified, conventional mass spectrometry). The use of an electron-beam probe is extensively discussed since this technique has been directly applied to rarefied, nonradiating, nitrogen-containing gas flows. Some of the techniques used in the past for measurement of gas temperatures are outlined.##

07885

R. J. Lewis, R. Smith, P. Baker

AN ANALYSIS OF INSTRUMENT DOWNTIME FOR A LARGE AIR MONITORING NETWORK. Preprint. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, (12)p., 1967. (Presented at the 60th Annual Meeting, Air Pollution Control Association., Cleveland, Ohio, June 12-16, 1967.)

There is a prevalence of opinion encouraged by company sales representatives that currently available continous air monitoring equipment is truly continuous and automatic. The word automatic as applied to present air monitoring instruments is defined by a detailed analysis of the type of instrument failures which can be expected. The experience is drawn from the operating reports and records of the Continuous Air Monitoring Project (CAMP). Failure of the instrument system can come about for many reasons, and is defined by the loss of anticipated valid data output. Three major causes for loss of data are instrument failure, personnel failure, and supply support failure. It is concluded that successful network operation of continuous air monitoring equipment demands careful design of support functions and personnel selection. A continual reanalysis of operating efficiency and upgrading of personnel training is mandatory. (Authors' abstract, modified)##

07938

M. L. Kain, B. T. Commins, G. Dixon-Lewis, J. F. Nunn

DETECTION AND DETERMINATION OF HIGHER OXIDES OF NITROGEN. Brit. J. Anaesthesia (Altrinham), Vol. 39, 425-431, 1967. 17 refs.

Methods are described for the determination of NO, NO2 or (2O4 as contaminants of nitrous oxide. Most of the discussion is related to nitrous oxide as an anesthetic, however, the most sensitive methods which will detect less than 1 ppm are appropriate for studies of air pollution. Saltzman developed a colorimetric method which uses the diazo reaction to determine NO2. It has been adapted for the measurement of NO. Nitrous acid is formed when NO2 dissolves, diazotizing sulphanilic acid which then couples with alphanaphtyl ethylene diamine to give a magenta color. The calibration is made by adding known amounts of sodium nitrite solution. Assuming that 1 mole of NO2 gives the same color as 0.72 moles of sodium nitrite, the concentration of NO2 can be determined if the volume of the test gas is known. Although there is some doubt about calibration, this test is the most reliable and sensitive one available at present. Concentrations of less than 1 ppm can be detected.##

07981

Green, A. E. S., D. T. Williams, R. S. Sholtes, and J. Dowling, Jr.

THE MIDDLE ULTRAVIOLET AND AIR POLLUTION. In: A. E. S. Green, ed., The Middle Ultraviolet: Its Science and Technology, New York, John Wiley & Sons, 1966, Chapt. 8, p. 158-164. 32 refs.

Currently in the air pollution field a great effort is underway to find and develop more specific methods of measuring contaminants. It appears that ultraviolet spectroscopy would be an important tool in measuring these trace species. The important pollutants such as nitrogen dioxide, sulfur dioxide, and ozone all have strong absorption coefficients in the ultraviolet, as do many of the other lesser pollutants and the products of the photochemical reactions which play such a large role in smog formation. Both chemical and spectroscopic methods have their advantages and disadvantages. Perhaps the greatest importance in utilizing ultraviolet spectroscopy is that a program which complements the chemical program could be obtained. The two programs working together should indeed contribute significantly to the body of knowledge which is necessary to solve the air pollution problem.

08077

Johnson, F. A.

DETECTION OF LOW LEVELS OF TETRAFLUOROHYDRAZINE IN AIR. Rohm and Haas Co., Huntsville, Ala., Redstone Research Labs., Contract DAAHOI-67-C-0655, S-137, 19p., June 1967.
DDC: AD 815940

Tetrafluorohydrazine was converted to fluoride ion by nitrogen dioxide and water. The fluoride ion was detected continuously by a commercial fluoride ion electrode. A 30-mV change in electrode potential was obtained for one part per million of N_2F_4 in the air. Various factors affecting sensitivity, stability, and speed of the detection system were considered. (Author|s abstract)

08079

Keenan, Robert G.

CHEMICAL ASPECTS OF ENVIRONMENTAL HEALTH. Occupational Health Rev.Ottawa, 18(1):3-8, 1966. 39 refs.

Modern methods of physical and chemical analysis, as applied to biological materials, atmospheric samples containing gaseous or particulate contaminants, industrial process materials, intermediates, and finished products are discussed briefly. A discussion of the uses to be made of such analytical data includes: (1) the "normal" concentrations of certain metallic elements in body tissues and fluides; (2) the need to compare these concentrations with those developed analytically on samples from exposed subjects; (3) the comparison of atmospheric concentrations of contaminating substances found in the working environment with the A.C.G.I.H. Threshold Limit Values; (4) the analysis of industrial process materials, settled dusts, and finished products to help in assessing the total exposure of the worker to chemical elements. (Author|s abstract, modified)

08135

V. A. Shchirskaya

THE DETERMINATION OF OZONE IN THE PRESENCE OF NITROGEN DIOXIDE AND HYDROGEN PEROXIDE. In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B.S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 20-23, May 1960.
CFSTI: TT 60-21475

In search of a new method for the determination of ozone the following were investigated: chronic anhydride as an absorbent for the fumes of hydrogen peroxide and silicagel saturated with a 0.02 M solution of potassium dichromate in concentrated sulfuric acid as an absorbent for nitrogen dioxide. In the determination of ozone in the presence of H_2O_2 chromic anhydride can be used as an absorbent for the hydrogen peroxide vapor in 0.005-1.1 mg/1 concentrations. Finely granulated silicagel saturated with a 0.02 M solution of potassium dichromate in concentrated sulfuric acid retained nitrogen dioxide present in the air in 0.001 - 0.02 mg/1 concentrations. It can be used in the determination of ozone in the air in the presence of nitrogen dioxide.##

08142

Mokhov, L. A. and V. S. Khalturin

A RAPID METHOD FOR THE DETERMINATION OF NITROGEN OXIDES IN THE AIR. In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards,- Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 54-56, May 1960. 4 refs.
CFSTI: TT 60-21475

For rapid determination of nitrogen oxides in the air, the indicator tube method is used containing silicagel, treated with benzidine-hydrochloride, 8-naphthol, NiCl2, and dried. In the presence of nitrogen oxides its color changes from the initial white to a stable red, the intensity of which is proportional to the concentration of nitrogen oxides in the air. The color developed in the tube is compared with a standard scale. Average sensitivity of the indicator equals 0.0005 mg/l and the precision is plus or minus 3.5%.##

08179

Mokhov. L. A., Y. F. Udalov. and V. S. Khalturin

RAPID DETERMINATION OF NITROGEN OXIDES IN THE AIR OF INDUSTRIAL PREMISES BY SPECIAL TUBULAR INDICATORS. Zh. Prikl. Khim., 32(2):452-453, 1959. 9 refs. Translated from Russian by B. S. Levine, U. S. S. R. Literature on Air Pollution and Related Occupational Diseases, Vol. 4, p. 56-59, Aug. 1960.
CFSTI: TT 60-21913

In this procedure H-acid, n-aminobenzoic acid, and nickel chloride are absorbed upon silicagel. The gel indicator thus obtained gradually changes its initial color from light pink to a brown-red in the presence of nitrogen oxides. As a result of the reaction between the oxides of nitrogen and the n-aminobenzoic acid , diazonium salt is formed. The diazonium sale then combines with the H-acid, which is the nitrogenous component in this reaction, while the nickel chloride acts as the catalytic agent to form the dyestuff. In making nitrogen oxide determination in the air, both ends of the prepared indicator tube are opened, and loo ml of the air to be tested is aspirated through the tube from the wide end in the direction of the cone-shaped end; the coloring of the indicator is compared with that of a standard scale, and the amount of nitrogen oxides expressed in mg/1. The sensitivity of the proposed tubular indicators was determined by checking against the standard Griss-Illosvay method and was found to be 0.0005 mg/1.##

08256

Buck, Manfred and Heinrich Stratmann

THE JOINT AND SEPARATE DETERMINATION OF NITROGEN MONOXIDE AND NITROGEN DIOXIDE IN THE ATMOSPHERE. Staub (English translation), 27(6):11-15, June 1967. 10 refs.
CFSTI: TT 67-51408/6 (HC $2.00)

In the use of the Saltzman reagent for the determination of nitrogen dioxide in the atmosphere, 1 mol NO2 is equivalent to 1 mol NO2 from sodium nitrate. It has been shown that this ratio factor depends on NO2 concentration; for 6 g NO2/N cu m it is about 0.62 and with increasing NO2 concentration it approximates the value of 1. Operating conditions are proposed for combined and separate determination of NO and NO2, under which no NO2 losses occur as a result of absorption of the required NO oxidation.

08418

Morgan, George B.

AN EVALUATION OF AN AUTOMATED LABORATORY PROGRAM FOR AIR POLLUTION ANALYSIS. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((13))p., 1967. 2 refs. (Presented at the Technicon Symposium on Automation in Analytical Chemistry, New York, N. Y., Oct. 3, 1967.)

In order to increase analytical output and efficiency, the Laboratory Services Section, Air Quality and Emission Data Program, has automated most of the wet chemical analytical procedures. Adoption of these automated systems has resulted in increased precision and accuracy, as well as a fivefold increase in production. A cost analysis is presented for several of the more common analyses routinely encountered in the air pollution laboratory. Also discussed in the paper is a method that this laboratory uses for the determination of precision and accuracy for the Technicon Autoanalyzer, which should be equally adaptable to other automated analytical instruments. Automated chemical methods are routinely run in this laboratory for pollutants such as ammonia (ammonium), sulfate, nitrate, nitrite, nitrogen dioxide, sulfur dioxide, aldehydes, and total oxidant.##

08838

Hoover, Gary M., Charles E. Hathaway, and Dudley Williams

INFRARED ABSORPTION BY OVERLAPPING BANDS OF ATMOSPHERIC GASES. Appl. Opt., 6(3):481-487, March 1967. 9 refs.

The spectral transmission of carbon monoxide, nitrous oxide, and mixtures of the two has been studied in the 2200 per cm region, where overlapping absorption bands occur. With spectral slit widths sufficiently large to include several absorption lines, it was found that the observed spectral transmittance of a mixture is equal to the product of the transmittances of the components measured separately, provided that sufficient mitrogen is added to give the same total pressure for all samples. This result was also obtained for overlapping bands of nitrous oxide and methane in the 1300 per cm region. The present work confirms earlier studies of overlapping bands of CO2 and water vapor. An investigation of the possible breakdown of the multiplicative property of transmission for narrow spectral slit widths was inconclusive. (Authors' abstract, modified)##

08859

Nash, T.

COLOROMETRIC DETERMINATION OF OZONE BY DIACETYL-DIHYDRO-LUTIDINE. Atmos. Environ., 1(6):679-687, Nov. 1967. 12 refs.

Diacetyl-dihydro-lutidine (DDL) has the highest affinity for ozone of a variety of reagents tested. On an arbitrary but practical scale, it is ten times better than thio compounds and 500 times better than iodide. DDL is easy to prepare and simple to use; if air is bubbled through a dilute aqueous solution, the amount of ozone present can be estimated by measuring the loss in optical density at 4120 A. With this loss a new strong band appears at 3070 A but the compound responsible has not been identified: it is not diacetyl-lutidine, the usual oxidation product of DDL. The molecular yield is not significantly different from that obtained using neutral buffered iodide, one of the recognized standards for ozone. There is little interference from peroxides, nitrogen dioxide or sulphur dioxide in the concentrations normally found in polluted air. (Author's abstract)##

09111

Chapman, Robert L.

THE ROLE OF OPTICS IN AIR POLLUTION MONITORING. Opt. Spectra, 1(3):15-18, 1967.

Optical instrumentation and analysis techniques commonly used in air pollution monitoring are described. Beginning with a definitive description of major air pollutants and their causes, the article traces the development and use of optical instruments for this purpose from the "beginning" more than two decades ago to present. Comprehensive descriptions of instruments and techniques currently in use and a brief discussion of developments that would still further enhance the value of optical instrumentation in this application are presented.##

09234

Martinelli, Giorgio

THE CONTINUOUS CONTROL OF AIR POLLUTION WITH INDUSTRIAL ANALYSERS. ((Il controllo continuo dell inguinamento atmosferico con analizzatori industriali.)) Text in Italian. Termotecnia (Milan), 21(10):558-565, Oct. 1967.

For protection against air pollution from increased vehicular traffic, urbanization, and industry, Italy established a law on air pollution control in August 1966. Some provisions of the law are cited. A monitoring system for continuous measurements of air samples involves wind direction, registration of concentrations, determination of pollutants, and the emitter. Better results could be obtained from a network of monitoring stations at various cities, and a plan is proposed for their establishment and operation, where continuous measurement would also be made of air temperature and humidity, concentrations of SO2, H2S, NO2, CO2,CO, and hydrocarbons. Photographs showing equipment and apparatus for the stations are reporduced. A schematic diagram depicts the picoflux apparatus for SO2 measurements; an electrical cell for measuring H2S is also shown. The URAS infrared analyzer is used to measure CO2. Analyses for CO, hydrocarbons and dust are discussed, along with the equipment for air pollution monitoring in Frankfurt, Germany.

09333

Lial W. Brewer, (ed.)

ANALYTICAL PROCEDURES FOR THE ENVIRONMENTAL HEALTH LABORATORY. Sandia Corp., Albuquerque, N. Mex., Industrial Hygiene Lab., SC-M-3044, 147 p., Feb. 1968. 13 refs.

This is a manual compiled of thirty-nine analytical procedures used by an industrial hygiene laboratory. The procedures for the following substances in air are included: The Determinaton of Acetone, Acid and Alkali Contaminants; Benzene, Toluene, and Other Aromatics; Beryllium (Spectrographic Method); Beryllium (Morin Method); Cadmium; Chromic Acid, Chromates, and Dichromates; Formaldehyde; Lead; Methanol; Nitrogen Dioxide; Oil Mist; Ozone (Colorimetric Method); Ozone (Titration Method; Phosgene; Silica (Colorimetric Method); Sulfur Dioxide; Thallium; and Zinc.##

09369

Wilson, H. N. and G. M. Duff

INDUSTRIAL GAS ANALYSIS: A LITERATURE REVIEW. Analyst, 92(1101):723-758, Dec. 1967. 712 refs.

Analytical methods are reviewed for: permanent and inorganic gases; analysis of liquefied or pure gases; fuel gases; flue gases; motor exhaust gases; analysis of micro samples; and atmospheric pollutants. The years from 1958 to about mid-1966 were covered. In no branch of analysis is the swing towards physical methods more marked than in gas analysis. There have been no important developments of the conventional methods during the last ten years; the chief advances have been the application of galvanic methods to "trace" of certain gases, and gas chromatography. The rapid spread of the electrogalvanic methods for the "on-stream" determination of traces is also most significant. The other most noticeable feature is the vast and increasing attention being paid to atmospheric pollutants of all kinds, particularly sulphur dioxide, sulphuric acid and hydrocarbons.##

09515

California State Dept. of Public Health, Berkeley, Air and Industrial Hygiene Lab.

A GUIDE TO OPERATION OF ATMOSPHERIC ANALYZERS. SDPH-2-40, 14p., May 1966.

Methods for both manual and continuous automatic sampling and analysis of the common air pollutants are described. Experiments are described for the measurement of sulfur dioxide using the West method. Total oxidant content of the atmosphere is analyzed using the Neutral Buffered Potassium Iodide Method, C1 through C5 atmospheric hydrocarbons are monitored and analyzed. Guides to the operation of atmospheric analyzers are reviewed.##

09721

Hofmeister, H. K., H. Hummel, and R. Kohlaas

CONTINUOUS DETERMINATION OF NO2 AND (NO + NO2) CONCENTRATION IN CHEMICAL PLANTS. ((Kontinuierliche Bestimmung der Konzentration von NO2 und (NO & NO2) in chemischen Produktionsanla- German. Chem. Ingr.-Tech. (Weinheim), (1/2):61-64, Jan. 1968. 4 refs.

An apparatus is described for the continuous determination of NO2, or NO + NO2, in the gas stream of chemical production facilities. A photometer suitable for plant operations is used for the direct measurement of NO2 levels. NO is oxidized to NO2 (using I2O3 at 110 deg. C.) and the concentration of total NO2 is then determined. A dilution process was developed in order to avoid the extraordinary difficulties involved in the determination of degree-of-oxidation at high levels of nitrogen oxides. The apparatus, which is described and illustrated by graphs, diagrams, and one photograph, was tested in a nitric acid absorption plant.

09770

Townsend, C. R., G. A. Giarrusso, and H. P. Silverman

THIN FILM PERSONAL DOSTIMETERS FOR DETECTING TOXIC PROPELLANTS. Magna Corp., Pedonodo Beach, Calif., Research and Development Div., Contract AF-33(615)-1751, Proj. 6302, Task 630203, AMRL-TR-66-231, 59p., Feb. 1967. 1 ref.
1967. 1 ref. CFSTI, DDC: AD 652849
CFSTI, DDC: AD 652849

The subject of this report is the development of a portable system for the detection of low concentrations of nitrogen tetroxide (N2)4), fluorine (F2), and unsymmetrical dimethylhydrazine (UDMH) in air. The detection system is based upon the change of electrical resistivity of thin metal films when exposed to these gases. Silver metal films coated with appropriate salts proved to be applicable to the detection of all three gases; however, the following sensitized metal films were found to be optimum: for N2O4, silver; for F2, copper; and for UDMH, gold. Using the best film and salt combinations found to date, N2O4 could be monitored over the range of 0.1 to 50 ppm, F2 over the range 1.0 to 50 ppm, and UDMH over the range 10 to 100 ppm, with a standard deviation of about 20 percent. The effects of temperature over the range 50 deg. to 90 deg. C and of humidity from 10 to 90 percent on the response characteristics of the thin film sensors were found to be significant but within the tolerance limits. Means for reducing these effects were suggested which, if successful, would, in effect, make this detection system practically independent of changes in the environment. A portable breadboard readout instrument was designed and fabricated for use with the sensors to form an integrated detection system for personal protection. (Authors' abstract)

09969

Chevalier, C. E.

A SPECTROPHOTOMETRIC DETECTOR FOR OXIDES OF NITROGEN. Pennsylvania State Univ., University Park, Dept. of Mechanical Engineering, Contract PHS-86-63-112, PSU-21, 16p., Aug. 1966. 4 refs.

A "dry" method is described which was developed by Nicksic and Harkins for the measurement of the nitrogen oxide content of automobile engine exhaust gases. It involves vapor phase oxidation of nitric oxide, the main nitrogen oxide in the exhaust gases, to nitrogen dioxide and determination of the concentration of the latter by means of a spectrophotometer. Nitrogen dioxides absorbs light energy strongly in the region of 320 to 500 millimicron while the other exhaust gas constituents do not. Satisfactory agreement between this method and wet methods, either the phenodisulfonic method or the widely used Greiss-Saltzman method has been shown. The Nicksic-Harkins method had been modified by substituting a suitably filtered light system for the monochromator source. The instrument described here, duplicates that modification but incorporates a few additional refinements. The calibration procedure is described and detailed operating instructions are given. (Author's abstract, modified)##

10092

Mirowska, Ewa

METHODICAL STUDIES ON THE DETERMINATION OF LOW CONCENTRATIONS OF NITROGEN OXIDES IN THE ATMOSPHERIC AIR. (Badania metodyczne nad oznaczaniem niskich stezen tlenkow azotu w powietrzu atmosferycznym. Text in Polish. Med. Pracy (Lodz), 17(3):218- 222, 1966. 3 refs.

The Griess-Illosway method is most often used to determine low concentrations of nitrogen oxides in the air and is known to detect microgram NO2 in 16 ml. of solution. To determine values within the range of the maximum permissible concentration (NDS) in working places set legally at 5 mg/cu m, a 0.2 l. air sample must be taken. In case of low nitrogen oxide levels in the atmospheric air, taking 1. air sample will permit detection of 0.1 mg/cu m, which is 50 times lower than NDS. Therefore, this latter volume is more satisfactory for use in determining the presence of atmospheric nitrogen oxides. The precondition for observations within the 0.1 m cu m range is a series of absorption tests of nitrogen oxides by an aqueous solution of sodium hydroxide and another series involving th reaction of nitrites with the Griess- Illosway reagent. Color reaction is most efficient at pH 3. The error of the described method is plus or minus 95 for a sample containing 1-10 micrograms o nitrites.

10242

Dimitriades, B.

METHODS FOR DETERMINING NITROGEN OXIDES IN AUTOMOTIVE EXHAUSTS. Bureau of Mines, Washington, D. C., RI 7133, 29pp., May 1968. 10 refs.

Five direct and indirect methods for determining nitrogen oxides in automotive exhausts have been evaluated from the standpoint of accuracy and applicability in current exhaust studies. These methods are: static oxidation in tank, Bureau of Mines method, Chevron Research method, phenoldisulfonic acid method, and direct measurement of NO. Results showed that methods requiring conversion of nitric oxide to nitrogen dioxide as a part of the analytical procedure are subject to errors introduced by the instability of NO2. The extent of some of these errors has been determined, and procedures have been developed to minimize undesirable influences. On the basis of the results obtained from this study, recommendations are made regarding procedures for batch type or continuous measurement of nitrogen oxides in exhaust streams.##

10489

Bufalini, J. J.

GAS PHASE TITRATION OF ATMOSPHERIC OZONE. Preprint, Public Health Service, Cininnati, Ohio, National Center for Air Pollution Control (8)p., April 1968. 9 refs.

Ozone can be selectively removed from a gas stream containing a variety of oxidants. Oxidant analysers can be made specific for ozone by incorporating a small gas reaction chamber on the instrument. Possible interferences from hydrogen peroxide, n-butyl hydroperoxide, peroxyacetyl nitrate, nitrogen dioxide, and peracetic acid are discussed. (Author's abstract)

10518

Engelhardt, Heinz

A GAS ANALYSER FOR THE MEASUREMENT OF IMPURITIES IN AIR. Instr. Review, 15(194):98-99, Feb. 1968 Translated from German, Electrotech. (B), No. 2, 1966.

A gas analyzer has been introduced which measures air impurities such as SO2, HC1, NH3, NO, NO2, CO, C12, and H2S. The instrument, called Picoflux, operates on an electrocunductivity principle. The various air contaminants are analyzed by using different electolyte solutions in the voltiac cell; if several gases are present, preliminary filtration is also employed. The instrument is suited for measuring low concentrations; 0 to 0.3 ppm SO2; 0 to 0.5 ppm HC1 and 0 to 1 ppm NH_3. The range is adjustable by a factor of 2.5 or 5 with the flick of a switch. An integrating recorder allows 10- or 3 minute mean measurement readings.

10672

Hersch, Paul A.

CONTROLLED ADDITION OF EXPERIMENTAL POLLUTANTS TO AIR. Gould-National Batteries, Inc., Minneapolis, Minn., 24p., 1968. 21 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul,Minn., June 1968, Paper 68-153.)

Experience with, and extensions of less known techniques of providing an air stream with a steady and adjustable level of a gaseous impurity are described. Leaving aside those means that employ moving solid parts, the paper discusses devices using liquid pistons, mikro-flow through channels, diffusion across channels and barriers, stream splitters for attenuation, and methods based on evaporation, electrolysis, chemical conversion, and irradiation. (Author s abstract, modified)

10902T

Sprenger, Gerhard

THE SPECTROGRAPHIC IDENTIFICATION OF NITRIC OXIDE OCCURRING IN AN INTERMEDIATE FASHION IN THE REACTION BETWEEN NITROGEN PENTOXIDE AND OZOEN. ((Die spektorgraphische Identifizierung des in der Reaktion zwischen Stickstoffpentoxyd und Ozon intermediar auftrendtenden Stickoxydes.)) Translated from German. Z. Elecktrochem., 37(8-9):674-678, 1937.

The reaction between nitric pentoxide and ozones was studied spectrographically at 20-40 degree C and NO_3 was identified as an intermediate product. The chain reaction mechanism was formulated and the calculated rate constant was found in good agreement with that obtained from kinetic data.##

11573

Lahmann, Erdwin

STUDIES ON AIR POLLUTANTS. II. MEASUREMENT TECHNIQUES AND EVALUATION. ((Die Untersuchung von Luftverunreinigungen. German. Bundesgesundheitsblatt, (11):161-167, May 26, 1967. 29 German. Bundesgesundheitsblatt, (11):161-168, May 26, 1968. 29 refs.

The second part of a detailed review of techniques for measuring the concentration of air pollutants deals with various parameters of the sampling procedure which affect the results of all analytical methods. These parameters include: the duration of the sampling period (or frequency of measurements), duration of the study, season and time of day when the samples are taken, frequency of discontinuous sampling, air density at the measuring sites, height of the sampling sites above the earth, and distribution of the sampling sites. The effects of some of these parameters on determinations of atmospheric SO2 and CO are shown by way of illustration. Sampling programs used in the German Federal Republic, Great Britain, and the USA (National Air Sampling Network and Continuous Air Monitoring Program) are described briefly. Finally, some of the problems arising in the evaluation of experimental air pollution data are pointed out (such as the skewed rather than Gaussian distribution of results).##

11574

Lahmann, Erdwin

STUDIES ON AIR POLLUTANTS. I. ANALYTICAL METHODS. ((Die Untersuchung von Luftverunreinigungen. I. Analysenmethoden.)) Text in German. Bundesgesundheitsblatt, (10):145-150, May 12, 1967. 71 refs.

This detailed review of the apparatus and techniques used for air pollution measurements deals with both sampling and analytical methods. A distinction is made between empirical or discontinuous and continuous methods of sampling and it is pointed out that only the latter can yield readily interpretable results. In connection with gas sampling techniques, the value of an impinger for increasing the rate of dissolution of gaseous pollutants is discussed. Methods are then described for the quantitative determination of SO2, SO3, NO2, NO, CO, H2S, HF, and NH3, and brief mention is made of the techniques of gas chromatography and flame ionization detection for traces of organic compounds. The two principal techniques for estimating the total particulate content of the air are dust-fall and dust-concentration determinations. The latter which depends on photoelectric measurement of the particle density after filtration is more difficult to perform, but more interesting from the health point of view.##

12004

Neerman, J. C.

CONTINUOUS MASS SPECTROMETRIC ANALYSIS OF AUTOMOTIVE EXHAUST FOR NITRIC OXIDE. In: Report on CRC Symposium on Exhaust Gas Analysis. Coordinating Research Council, Inc., New York, N. Y., Group on Composition of Exhaust Gases, CRC-RN-404, pp. 61-64, Sept. 21-22, 1965.

A small, portable mass spectrometer to monitor nitric oxide concentration in automotive exhaust is described. The combined response time of the instrument and sampling train is 3 seconds, which satisfactorily follows the California Motor Vehicle Pollution Control Board test cycle. The instrument gives rapid response. Interference by compounds which have the same mass as NO, such as a CO isotope, formaldehyde, ethane, and a nitrogen isotope, is discussed.##

12009

Shively, J. H.

GRAB SAMPLING TECHNIQUES. In: Report on CRC Symposium on Exhaust Gas Analysis. Coordinating Research Council, Inc., New York, N. Y. CRC-RN-404, pp. 105-107, Sept. 21-22, 1965.

Grab sampling, which is batch sampling in flasks and syringes, serves a useful purpose in limited applications. Grab sampling techniques are useful; if the equipment needed for other methods is not available, and for proving out the other sampling systems. The development of grab sampling techniques is discussed. The procedures used are described, and precautions to be observed are outlined.

12579

Bovee, H. H. and P. A. Breysse

STUDY OF AIR QUALITY AND CONTAMINANT ANALYSIS FOR WORK UNDER COMPRESSED AIR. Am. Ind. Hyg. Assoc. J., 29(5):432-438, Sept.-Oct. 1968. 6 refs.

The quality of air in a tunnel being constructed under pressures varying from 0 to 30 psig was monitored for a period of 24 months. Except for an electrical fire and an oxygen deficiency incident, the tunneling was completed without hazardous levels of air contaminants being encountered. The compressor facilities and sampling and analytical procedures are described. (Authors' abstract) ##

13031

Bailey, Robert L.

CONTROL ATMOSPHERE FOR GAS SAMPLING APPARATUS. (National Distillers and Chemical Corp. New York, N.Y.) U.S. Pat. 3,449,958. 4p., June 17, 1969. 2 refs. (Appl. Apr. 25, 1966, 3 claims).

A basic atmospheric sampler comprises an apparatus having an inlet through which atmosphere is withdrawn from a container, the inlet of the sampler being movable between a first position at which the atmosphere is removed from the container and a second position where the inlet of the sampler is clear of atmosphere from within the container. The sampler can include any type of detection cell or device for monitoring the quality or nature of the atmosphere sample. The present invention adds to this basic combination a source of control atmosphere and a device to insure that the control atmosphere is directed to the inlet of the sampler when the sample inlet is in its second position, clear of atmosphere within the container. The use of the control atmosphere provides a known atmospheric reference for balancing and otherwise calibrating the detection cell and associated equipment. It also assists in purging the sampler and associated atmosphere testing devices between successive tests,

so that the devices can be recycled and used effectively to test the atmosphere from within successive containers.

13070

Himi, Yasuji and Fumio Muramatsu

SAMPLING METHOD FOR DETERMINATION OF NITROGEN OXIDES IN FLUE GAS. (Endo-haigasu chu no chisso-sankabutsu bunseki-yo shiryo-gasu saisyu-ho no kento). Text in Japanese. Bunseki Kagaku (Japan Analyst, Tokyo), 18(6):710-716, 1969. 6 refs.

The concentrations of nitrogen oxides in exhaust gas emitted from oil-fired boilers were measured by using three kinds of gas sampling apparatus, and the sampling method for their determination in flue gas was examined. The values of nitrogen oxides by the gas sampling apparatus prescribed in JIS K 0104 agreed well with those by direct gas sampling through capillary tube and by a bottle containing 22% sodium chloride solution as the trapping liquid. The concentration of nitrogen oxides was invariable at any sampling point in the same section of flue. The bubbler containing 0.1 N sodium hydroxide solution used for the determination of nitrogen dioxide in flue gas had high absorbing efficiency for carbon dioxide, and the volume of gas must be corrected for this influence by titration of carbonate ion in the absorbing solution after sampling. (Author abstract modified.)

13087

Gupta, S. K. and P. K. Bandyopadhyay

NITROUS GASES-A HAZARD IN MINES AND INDUSTRIES. J. Mines Metals Fuels, 17(2):50-52, Feb. 1969. 8 refs.

The highly toxic nature of nitrogen oxides demands periodic checks on the gases in working places where they are likely to occur. Underground mines, defense installations, and many chemical factories and industrial shops are important sources of nitrous fumes. Oxides of nitrogen are produced in mines by shot firing and diesel engines. Incomplete detonation or burning of nitroglycerine explosives may produce N oxides in considerable quantities. Explosives with improper oxygen balance can produce these gases on detonation. The exhaust gases from diesel engines contain NO_2, N_2O_4, and NO in addition to CO, SO_2, and SO_3. Concentrations of N oxides and CO must be lower than 1000 and 2000 ppm, respectively, in exhaust gas emissions for underground vehicles. Attention should be given to the acidic nature and solubility of N oxides in collecting gas samples. Samples collected in moist or soft glass bottles by air displacement are seldom representative. Two practical pieces of gas-sampling equipment are described. A widely used test to detect the presence of N oxides employs starch-iodide papers which turn blue on exposure to nitrous fumes. Sulfur oxides interfere with this test, as they too liberate iodine from potassium iodide. Three colorimetric methods of N oxide determination are reviewed. Recommended first aid measures for people suspected of inhaling nitrous fumes are listed.

13422

Lahmann, Erdwin and Karl-Ernst Prescher

HYDROGEN SULFIDE DETERMINATION IN AIR WITH AUTOMATIC SAMPLING. (Schwefelwasserstoff-Bestimmung in Luft mit automatischer Probenahme.) Text in German. Wasser Luft Betrieb, 12(9):529-531, Sept. 1968. 9 refs.

A simple procedure is described for H2S determination based on photometric measurement of methylene blue formed in the reaction of H2S with dimethyl-p-phenylenediamine in the presence of Fe(III) chloride. Samples of atmospheric air are passed through an alkaline cadmium hydroxide suspension which blinds the H2S present as cadmium sulfide. Its usefulness for determination of the H2S content of contaminated air can be enhanced by automatic sampling with the aid of a commercially available control device with 12 standard impingers. However, the following conditions must be met: (1) the cadmium hydroxide suspension in the impingers must be freshly prepared in order to maintain its absorption capacity for at least 24 hrs; (2) the cadmium sulfide suspension formed upon sampling must remain stable for at least 24 hrs; and (3) the volume of the air sample must be measured with sufficient accuracy. Tests designed to find out whether these requirements can be met gave positive results. In addition, tests to determine the cross-sensitivity of the H2S determination to SO2 and NO2 showed that it is not perceptibly affected by the presence of 1 mg/cum of SO2 or NO2 in the air sample. However, in the presence of these quantities of SO2 and NO2, the cadmium sulfide content of the absorption suspensions was lowered by about 20%. This effect could be leiminated by adding 5 ml of a 1.2% solution of ammonium amidosulfonate to 400 ml of the alkaline cadmium hydroxide suspension.

13493

Rakowski, Robert F.

EVALUATION OF THE USE OF COMMERCIALLY AVAILABLE DETECTORS FOR HYDRAZINE AND NITROGEN DIOXIDE AS COLORIMETRIC DOSIMETERS. Aerospace Medical Research, Wright-Patterson AFB, Ohio, Medical Div., Proj. 6302, Task 630203, AMRL-TR-68-163, 5p., Feb. 1969. 4 refs.

The color response of several commercially available detector papers for hydrazine and nitrogen dioxide was determined in order to evaluate their usefulness as personal dosimeters. The Bug-it H25b Hydrazine Detector gave satisfactory results in the concentration-time (CT) range of toxicological interest. Appropriate color standards should be prepared and a reusable holder for the detector strips manufactured. The Bug-it H30A Nitrogen Dioxide Detector was satisfactory as a detector for low concentrations of nitrogen dioxide, but did not give colors which darkened enough to permit a quantitative estimate of the CT product to which the strips were exposed. Melpar Nitrogen Dioxide Detector tapes were also satisfactory as a detector for low concentrations of nitrogen dioxide, but since the color developed did not darken at all with increasing time, it was not possible to estimate the CT product of an exposure with this detector. Tables show the response of the three detector papers. (Author's abstract modified)

13932

Bethell, K. D., J. T. Shaw, and A. C. Thomas

AN IMPROVED FORM OF SOLID OXIDISER FOR THE CONVERSION OF NITRIC OXIDE TO NITROGEN DIOXIDE IN A FLOW SYSTEM. Chem. Ind. (London), no. 3:91, Jan. 20, 1968. 2 refs.

The oxidizer for accurate NO measurement is prepared by immersing a quantity of glass wool in a bath containing 15 g of $K_2Cr_2O_7$ and 15 g of 98% H_2SO_4 made up to 100 ml with distilled H_2O. After soaking, the glass wool is removed and excess solution is allowed to drain off. The impregnated glass wool is dried in an air oven at 65 C until the color has changed from orange to dark red. Eighteen hours suffices for a 30 g sample. After drying, the material is placed in a constant temperature box in a water bath at 25 C for a half hour. Tests with NO concentrations up to 100 ppm and flow rates of 140 ml/min showed conversions to the dioxide in excess of 97% for at least 90 min, and above 95% for 3 hrs.

13989

Oblaender, K. and D. Kraeft

DETOXICATION OF AUTOMOTIVE EXHAUST GASES - MEASURING METHODS AND TEST CYCLES. (Abgasreinigung an Kraftfahrzeugen - Messverfghren und Testzyklen). Text in German. ATZ (Automobiltechnische Zeitschrift) (Stuttgart), 71(4):117-124, 1969. 24 refs.

Detoxification of automotive exhaust gases raises not only motor engineering problems but also measurement engineering problems. The various methods for measurement of CO based on heat conductivity, on heat evolution and an infrared absorption are discussed and compared. The disadvantages of hydrocarbon measurements in the hexane range and of the flame ionization method are pointed out. Also discussed are the measurement of nitric oxide and the existing and planned multi-stage test cycles. A brief discussion of the possibilities of lowering the exhaust gas emission by motor modifications, the effects of traffic, and the fuel composition is included.

14076

Breuer, Wolfram

NEW METHODS OF CONTINUOUS TRACE ANALYSIS. (Neue Verfahren zur kontinuierlichen Spurenanalyse). Text in German. Arch. Tech. Messen, no. 396, p. 7-12, Jan. 1969. 2 refs.

A detailed description is given of two electrolytic continuous recording devices for measurement of small traces of gases present, for example, in atmospheric air. An earlier version with a liquid electrolyte was based on Nernst's concept of a concentration chain. The new version uses an organic substance as an electrolyte which has a high dielectric constant, a low electric resistivity, a low vapor pressure, is but slightly hygroscopic, and possesses a high melting point. This electrolyte is solid and is part of a monolithic, small and rugged unit. The accuracies of measurements made by these devices vary between dilutions of 10 to the minus 9th power and 0.000001, depending on the kind of gas. At present, the following gases can be determined with these accuracies: O2, O3, Cl2, NO2, NO2 plus NO, H2S, HCN, and COCl2.

14213

Haentzsch, Siegfried, Frank Nietruch and Karl-Ernst Prescher

CONTINUOUS DETERMINATION OF NITROGEN DIOXIDE IN THE AIR WITH AN AUTOANALYZER. (Kontinuierliche Bestimmung von Stickstoffdioxid in Luft mit dem Autoanalyzer). Text in German. Mikrochim. Acta (Vienna). no. 3:550-556, 1969. 17 refs.

For continuous nitrogen dioxide measurement in air, a Technicon autoanalyzer was used. A sample gas flow was drawn in through a reaction zone where it was brought in contact with a Saltzman solution. After reaction with the nitrogen dioxide, the major part of the solution went to a colorimeter. The transparency of this solution was measured and recorded. The following reaction zones were used: a siphon, a vertical reaction tube of about 60 cm length and 3.2 mm inner diameter, the gas sample and reagent passed in parallel flow, as well as in counter flow, through the tube, a helical tube, and a micro frit for continuous flow of the Saltzman solution. For calibration, a continuously produced mixture of NO2 and air was used. In all types of reaction zones, reliable NO2 measurements were obtained. The measured concentrations were found to lie in the maximum allowable concentration range (present long-term maximum allowable concentration equal 1 mg/cu m). With the 60 cm tube, it was found that neither the flow velocity nor the direction of the gas sample had any influence on the measured value. An adjustment time of 2 min was required for NO2 concentrations between 0.32 and 3.2 mg/cu m. In the 20 m tube, adjustment took about 60 min at concentrations between 0.11 and 1.10 mg NO2/cu m. For the micro frit, a low-volume container must be used for the adjustment period to remain short. The detection thresholds were found to be 5 micrograms/cu m for the 20 m helical tube and 0.15 mg/cu m for the 60 cm tube. The only disadvantage of the method is the complicated calibration process.

14429

Shaw, Manny

ELECTROCHEMICAL TRANSDUCERS FOR AIR POLLUTION MONITORING. Preprint, Am. Chem. Soc., Pittsburgh, Pa., Div. Water, Air, Waste Chem., 4p., 1969. (Presented at the Am. Chem. Soc., 158th Natl. Meet., Div. Water, Air, Waste Chem., New York, 1969.)

Electrochemical transducers that permit the monitoring of SO2, NO, and NO2 in the presence of hydrocarbons, CO, CO2, ozone, oxygen, nitrogen, and water are described. By the proper selection of electrolyte, membrane, sensing electrode catalyst, counterelectrode, or potentiostatic control, electrochemical sensors can be made selective to SO2 in the presence of NOx and vice versa, as well as selective to NO2 in the presence of

SO2 or NO. Full-scale sensitivities range from 0 to 2, or 0 to 1000 or 5000 ppm. Minimum detectability at present is 0.04 ppm. Response times of 10 seconds to 90% of steady-state value have been obtained. Present sensors are compensated to permit operation with samples varying from 40-100 F. The technology of the electrochemical transducer is described. It is a sealed unit, easily integrated as a component part of the monitor, the remaining components being electronic in nature. Operation of the monitor is simple, involving adjustment of only three control knobs. The use of the electrochemical transducer-type of monitor for the continuous analysis of nitrogen oxides in vehicle exhaust emissions is briefly noted, as well as its possible application for monitoring SO2 in certain industrial emissions. (Author introduction modified)

14486

Uhi, K.

THE DETERMINATION OF ACIDIC GASES IN WORKING ENVIRONMENTS BY ALKALI FILTER PAPER. (Alkali roshi ho ni yoru sagyo kankyo chu sansei gas no sokutei). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hyg.), 24(1):49, April 1969.

The alkali filter paper method for determining acid gases in working environments entails soaking filter paper in a 30% potassium carbonate solution, drying the paper in air, and putting it in a vinyl holder having an exposure area of 64 sq cm. Absorbed gases are extracted with distilled water and determined qualitatively and quantitatively. The required exposure time is determined by the type of acid being measured, the production process, and the sensitivity of the determination method. Generally, 1 to 8 hrs are appropriate for acidic gases like SO2, HCl, and NO2, and 8 to 24 hrs for acid mists of sulfuric, phosphoric, and chromic acids. One hour is usually required for SO2 measurements by the para-rosaniline formaline method; the CL-Ba method requires 8 to 24 hrs. When the relationship between the amount of SO2 adsorbed on the filter paper and the average gas concentration in the working environment is plotted, a curve is obtained. Thus, on a per day basis, the coefficient of conversion depends on the amount adsorbed. However, the graph for an hour of exposure time is linear, suggesting that shorter exposure times would be convenient for the calculation.

14502

Her Majesty's Factory Inspectorate, Dept. of Employment and Productivity

METHODS FOR THE DETECTION OF TOXIC SUBSTANCES IN AIR. OZONE IN THE PRESENCE OF NITROUS FUMES. London, Her Majesty's Stationery Office, Booklet 18, 1969, 10p. 4 refs.

The occurrence, toxic effects, and detection of ozone are reported. Ozone is present in very small quantities in the atmosphere, and following and during electrical storms, it may reach sufficiently high concentrations to be recognizable by odor. It is used for water sterilization, bleaching of oils, paper, and flour, and combating odors in place of proper ventilation. Ozone is formed industrially during high-tension, non-sparking discharge in air or oxygen, during electrical etching of polyethylene film, and during electric arc welding using an inert gas cover. Toxic effects include headache or respiratory irritation at low concentrations, and pulmonary edema ard inflammation of the lung which are delayed and are found at concentrations as low as 1 ppm. The method for detection of ozone is based on the ability of cotton wool to remove ozone quantitatively from an atmosphere without affecting its nitrogen dioxide content. The analysis of an atmosphere both with and without passage through a cotton wool plug will give a measure of the ozone concentration present. A starch-iodine colorimetric procedure is employed for quantitative estimation by comparison with glass color standards.

14550

Hersch, Paul A.

GALVANIC AIR POLLUTION MONITORING, AIDED BY CATALYSIS. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 359-362. 3 refs.

Several galvanic systems that can serve as simple, sensitive, and selective analyzers for continuous air pollution monitoring operations are briefly described. One such system involves combining a partly gas-exposed cathode with a stagnant alkaline electrolyte and a base metal anode; in other systems, the electrolyte may in some cases be advantageously recirculated, using the sample air stream for lifting the liquid. Cells have been developed for monitoring carbon monoxide, nitric oxide, ozone, and sulfur dioxide. Thus, all the major pollutants except hydrocarbons can now be monitored by galvanic systems; sensors for aldehydes and olefins are likely to follow. The cells avoid pumping liquid reagents into the analyzer and disposing of spent reagent. They also avoid the temperature dependence and inherent instability of membrane-covered 'polarographic' sensing devices. Without a membrane barrier, a major portion and sometimes all of the sampled, electromotively-active species reaches the electrode. The importance of the relation between galvanic air pollution sensors and catalysis is discussed. The pollutant may enter a catalytic reaction, depending on the electrode it contacts, or it may itself act as a catalyst. Catalysis is involved in calibration procedures and may help in making an analyzer more specific. Catalysts also have an important place in precursor-reactors which convert an analytically intractable constituent to one that is more readily amenable to determination.

14551

Shaw, Manny

ELECTROCHEMICAL TRANSDUCERS FOR AIR POLLUTION MONITOR. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 401-410.

Recent developments at Whittaker Corp. relating to the design and performance of electrochemical transducers for the continuous monitoring of pollutant gases are discussed. These are devices operating on the principle of electrooxidation or electroreduction of adsorbed pollutant species at a sensing electrode, resulting in the generation of a current directly proportional to the partial pressure of the gas in the mixture under analysis. Such a transducer is a sealed, maintenance-free sensor, and is essentially an adjunct to the electronic packaging comprising the total monitor. A series of diagrams is presented; these show (1) some typical half-cell reactions representing the electrooxidation of SO2 and NO; (2) a schematic diagram of the sensor; (3) the mathematical expression of the diffusion current generated in the reaction; (4) and (5) linear responses for various concentrations of NO and SO2; (6) a photograph of a vehicle emission monitor now on the market; and (7) a portion of a typical 7-mode cycle vehicle emission test that demonstrates that the electrochemical transducer can faithfully reproduce each peak and valley of nitrogen oxide concentration as it varies with the acceleration and deceleration mode.

14837

Forwerg, Walter and Hans-Joachim Crecelius

DETERMINATION OF NITROUS OXIDE IN ATMOSPHERIC AIR. Staub (English translation from German of: Staub, Reinhaltung Luft), 28(12):16-19, Dec. 1968. 5 refs.

The determination of nitrous oxide content in air was investigated. Determination is facilitated when two separate gas flows are studied, into one of which an oxidation agent is introduced to effect oxidation of NO to NO2. The difference between the two resulting NO2-concentrations gives the NO-concentration. The degree of oxidation is 97% in a concentration range between 0.2 and 0.5 ppm NO. The moisture content of the test gas was reduced by phosphoric acid, so that an oxidizing mass stability of several weeks was reached. Since the degree of oxidation depends on oxidant layer thickness and on rate of flow, the retention time was measured in order to determine the optimum layer thickness and flow rate. The maximum allowable retention time in the oxidant was 0.8-1.0 seconds. No linear dependence in the range from 5-50 1/hr could be established. The temperature range for favorable oxidation lies between 0-30 C. In the range between 0.2-0.5 ppm NO in air, no dependence of the degree of oxidation on concentration could be established. For a steady concentration of 0.1 ppm NO2 and about 0.1 ppm SO2, no change in the degree of oxidation could be detected in industrial air contaminated with organic substances, ammonia and dust after 4 weeks and a throughput of 50 cu m of air. The standard deviation of the determination is about 5.5% rel., for 1 mg NO/cu m; the determination limit is 0.4 micrograms NO.

14992

Shaw, John H., Dale Ford, Donald Snider, and Robert Mitchell

RESEARCH DIRECTED TOWARD DETERMINATION OF RADIOACTIVE PROPERTIES AND COMPOSITION OF THE ATMOSPHERE. (Final Report.). Ohio State

Univ. Research Foundation, Columbus, Contract F19628-67-C0216, Proj. 7670-03-01, Task 767003, AFCRL-69-0062, 70p., Dec. 16, 1968. 13 refs.
AD 685097

Progress in the construction of a Fabry-Perot interferometer to use in increasing the resolving power of the 2.0 m Ebert-type spectrometer in the region of 4 to 6 microns is described, including the optical alignment procedures used and the control system design. A 21-m long, 76-cm diameter stainless steel multiple traversal absorption cell was constructed and its performance is described. Preliminary measurements of the abundance of ground level CO in laboratory air were made by using the line R of the fundamental vibration band; they indicate that this method of air sampling is accurage, unambiguous, and rapid. Two related papers are included as appendices: one presents measurements of the strengths of the N2O bands near 4.5 microns; the other discusses the infrared spectrum of ozone. (Author abstract modified)

15171

Yamate, Noburu

MANUAL METHODS AND AUTOMATIC CONTINUOUS INSTRUMENTS FOR MEASUREMENT OF GASEOUS AIR POLLUTANTS. (Gasujo taiki osenshitsu no sokutei to sono sokuteikiki). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 5(10):785-796, Oct. 1969. 36 refs.

In order to prevent air pollution, measurement of pollutant concentrations must be continuously performed. In this report, both continuous monitoring and manual analyses of typical air pollutants are reviewed. Numerous methods are tabulated and most of them are explained, with particular attention to continuous methods and apparatus. Sulfides are measured manually by colorimetric analysis with rosaniline or barium molybdate, by the lead per oxide method, or by test paper methods. Sulfides are also measured continuously by means of solution conductance (Thomas autometer) or by optical absorption with rosaniline or with iodine-starch. Carbon monoxide is measured manually with palladium sulfate and ammonium molybdate, by gas chromatography, or by the hopcalite method. It is measured continuously by infrared or ultraviolet absorption of reduced mercuric oxide. Nitrides are measured manually by the Saltzman or the Jacobs method, or with ortho-tolidine sulfate. Hydrogen sulfide is measured manually by methylene blue and continuously by a colorimetric filter paper method. Hydrocarbons are measured manually by gas chromatography and continuously by flame ionization detectors. Formaldehyde is measured manually by colorimetric analysis with a chromotropic acid or with acetylacetone, or by the MBTH method. Ozone is measured manually by the phenolphthalein or the potassium iodide method and continuously by coulometric titration or by optical absorption with potassium iodide. Fluorides are measured manually by colorimetric analysis with thorium neothron(?) or lanthanum alizarin complex and continuously by filter paper fluorescence. Actual Tokyo data on changes in the concentrations of carbon monoxide, nitric oxide, and nitrogen dioxide are tabulated.

15210

Purcell, R. F., R. R. Bennett, and J. T. Allen

A TEST FOR STABILITY OF SOLVENTS TO ULTRAVIOLET RADIATION. Am. Chem. Soc., Div. Org. Coatings Plastics Chem., Preprints, 29(2): 441-444, 1969. (Presented at the Am. Chem. Soc., 158th Meeting, New York, Sept. 1969.)

A simple screening test was devised to determine the stability of solvent vapors to ultraviolet radiation in the presence of NO2. Stability is measured by following the disappearance of the solvent as shown by gas chromatograms taken at various time intervals. Multiple runs were made on most of the solvents and excellent reproducibility was obtained. The test results indicated considerable variation in the stability of various solvents under these static conditions. The test is a simple and inexpensive method for measuring solvent stability to ultraviolet radiation. If an equally simple test for eye irritants can be found utilizing irradiated samples from this method, a useful test for screening smog-producing potential will be possible.

15342

Nucciotti, Francesco, Paolo Mandrioli, and Giovanni Sandri

IMPROVEMENTS IN SAMPLING TECHNIQUES AND IN THE METHODS FOR DETERMINING ACID GASES IN THE ATMOSPHERE. (Miglioramenti tecnici nel campionamento e nella metodica per la determinazione di gas acidi nell'atmosfera). Text in Italian. Riv. Ing., no. 5:353-356, May 1969. 11 refs.

Deterioration of pine forests near industrial complexes on the Tyrrhenian and Adriatic seacoasts of Italy led to systematic investigation of air pollution. Chief offenders were found to be the sulfur and nitrogen oxides. To build a sampling network meant developing a practical method, easily reproducible and low in cost. The method of Syozo-Fukui, using a filter soaked in a concentrated K2CO3 solution, seemed best. Analysis of the filter permits determination of SO3, the oxides of nitrogen, and chlorides. Results were good when the relative humidity was below 70%. The filter salt was highly deliquescent, and above 70% humidity significant quantities of test substance escaped. Therefore, a framework equipped with an interchangeable condenser and sheltered by an acrylic plastic casing, the whole being enclosed in a meteorological shelter was provided to hold the filter. For transportation to the laboratory, the filter was sealed hermetically in polyethylene. The method of Fukui was used for nitrogen oxides, but for SO3 that of Johnson-Nishita was preferred: reduction of all sulfur compounds to hydrogen sulfide, measured colorimetrically with methylene blue to a sensitivity of 0.2 ppm. A Schleicher 589 filter was used immersed in K2CO3 solution and dessicated in a vacuum. At the laboratory, nitrogen oxides, sulfur, H2S, and sulfides were determined spectrophotometrically. Agents used for determining nitrogen oxides were sulfanilamide, naphthylethylenediamine, hydrochloric acid, and a standard solution of NO2.

15354

Wilson, K. W., G. J. Doyle, D. A. Hansen, and R. D. Englert

PHOTOCHEMICAL REACTIVITY OF TRICHLOROETHYLENE AND OTHER SOLVENTS. Am. Chem. Soc. Div. Org. Coatings Plastics Chem. Preprints, 29(2):445-449, 1969. 6 refs. (Presented at the 158th Meeting of the Am. Chem. Soc., Div. Organic Coatings and Plastics Chemistry, New York, Sept. 1969.)

A special smog chamber was built to study the slowly reacting solvents which, in the presence of nitrogen oxides, form smog much more slowly than do automobile exhausts. The chamber has Pyrex panels with an access wall of cast aluminum. The aluminum wall incorporates eye ports for measurement of eye irritation, an access hole for the optics of a miltireflection infrared cell, and sampling ports through which gas is removed for wet chemical analysis. An air purification system for the chamber removes contaminants by catalytic combustion over platinum at 5-8 atm and 500 to 600 C and cools the purified air to below 327 C and about 1 atm. Performance of the chamber was validated by charging it with test hydrocarbons, e.g., ethylene, cyclohexane, tricholoroethylene, xylenes, and paraffins at 1, 4, or 8 ppm and nitric oxide at 0.25, 1, or 2 ppm. The photooxidation experiments show that the rate of photochemical smog formation decreases as the hydrocarbon:nitric oxide ratio decreases and that eye irritation is caused primarily by formaldehyde. As judged by its rate of disappearance, trichloroethylene is less reactive than ethylene. Trends observed with changing concentrations of trichloroethylene also suggest that average atmospheric concentrations of trichloroethylene would produce no eye irritation or other measurable smog symptoms.

15484

Lang, Helen W., W. E. O'Neill, R. A. Coulehan, and R. W. Freedman

CONTINUOUS MONITORING OF DIESEL EXHAUST GAS FOR CARBON DIOXIDE, CARBON MONOXIDE, OXYGEN, METHANE, AND NITROGEN OXIDES. Bureau of Mines, Washington, D. C., RI 7241, 14p., March 1969. 9 refs. CFSTI: PB 183386

A monitoring system was applied to provide rapid, continuous analyses of diesel exhaust gas. Commercially available continuous analyzers with strip chart readout were employed for nitric oxide, carbon dioxide, methane, carbon monoxide, and oxygen. All five continuous analyzers performed satisfactorily during the preliminary testing and were used successfully during several actual diesel approval tests. The results were checked by two independent analytical methods: gas volumetric and gas chromatographic analyses. It was shown that the use of nondispersive infrared analyzers is a generally accepted technique for on-stream analysis of carbon dioxide, carbon monoxide, and methane gases. Polarographic analyzers worked well for on-stream analysis of oxygen. Mass spectrometry was used to determine the nitric oxide content. Strip chart recorders provided permanent records of all concentration changes during the course of the approval tests. It was believed that the use of analyzers would speed up the diesel approval testing procedure.

15521

Nietruch, Frank and Karl-Ernst Prescher

DILUTION SYSTEM FOR LOW CONCENTRATIONS OF NITROGEN DIOXIDE AND DETERMINATION OF THE SALTZMAN FACTOR. (Dosierung kleiner Stickstoffdioxid-Mengen und Bestimmung des 'Saltzman-Faktors'). Text in German. Z. Anal. Chem., vol. 244:294-302, 1969. 40 refs.

A dynamic flow system is described by which dinitrogen tetroxide (N2O4) is diluted with air in two steps to obtain NO2 concentrations in the ppm range. Through thermostatization of the first stage, the dissociation of the dinitrogen tetroxide could be taken into account during calculation of the NO2 end concentration. With the NO2/air mixture obtained by this method, the Saltzman photometric analysis of NO2, which is based on the formation of an intensely colored azo dye was tested. The results obtained with gaseous NO2 and with equivalent amounts of aqueous nitrite solution are compared. At a concentration of 1.5 micrograms NO2 per 25 ml absorbing solution, the dye formation by 1 mole NO2 equals that of 1 mole of nitrite ('Saltzman-factor' 1.0). If the concentration is 10 micrograms/25 ml, the intensity of the color effect due to 1 mole of NO2 equals 0.86 moles of nitrite ('Saltzman-factor' 0.86). Only half the expected color intensity was found when a NO2/air mixture was used that had been prepared by a dynamic two-step dilution and oxidation of NO ('Saltzman-factor' 0.5).

15752

Hatterer, Andre and Michel Forissier

PSEUDOCHROMATOGRAPHIC MICROANALYSIS UTILIZING GAS-SOLID EQUILIBRIA. DETERMINATION OF NO2, NOCl, Cl2, HCl, CO2 AND H2O. (Microanalyse pseudochromatographique utilisant les equilibres gaz-solide. Dosage de NO2, NOCl, Cl2, HCl, CO2, H2O). Text in French. Z. Anal. Chem., vol. 247:266-271, Oct. 1969. 12 refs.

Gas separation was carried out in two stages, condensation and sublimation, in a small metal tube exposed to a temperature gradient from 77 to 300 K. A non-condensable gas such as helium, hydrogen or nitrogen was used as a carrier. In the first stage, the components of the mixture were selectively solidified in the cooled tube under partial pressures below those of the triple points. In the second stage, heating of the tube with an inverted temperature gradient caused sublimation and completes the separation. Catharometers or mass spectrometers were employed for the detection and determination of the gases. Gases could be determined in the range of 0.000001 to 0.0001 mole/ml of gas. (Author abstract modified)

15904

Braman, Robert S.

EMISSION-TYPE DISCHARGE STUDY OF SOME AIR POLLUTANT COMPOUNDS. Preprint, American Chemical Society, Washington, D. C., Div. of Water and Waste Chemistry, 16p., 1969. 3 refs. (Presented at the American Chemical Society, 158th National Meeting, Division of Water, Air, Waste Chemistry, New York, Sept. 8-12, 1969.)

The applicability of a four-channel DC discharge system to gas chromatographic analysis of air pollutants was investigated in laboratory analyses of automobile exhaust and other gas mixtures. Air pollutants studied included carbon monoxide, sulfur dioxide, nitrogen oxides, and carbonyl sulfide. Alkanes, alcohols, and other compounds were also investigated for comparison purposes. The four major wavelengths observed were 5165 C2; 4312 CH; 4216 CN; and 6562 H. The detector gave good response patterns suitable for qualitative identification of gases and pollutants and was particularly useful in confirming the identity of air peaks, hydrogen, CO, hydrocarbons, and CO2. Limits of detection air in the ppm range. The limits need improvement if sub-ppm concentrations are to be directly analyzed and detected in air. Data presented in the form of tables include wavelength and band/line spectra of analyzed compounds, response data, and emission ratios for a series of alcohols.

CONTROL METHODS

00003

HEARINGS - S 306. A Bill to Amend the Clean Air Act to Require Standards for Controlling the Emission of Pollutants from Gasoline-Powered or Diesel-Powered Vehicles, to Establish a Federal Air Pollution Control Laboratory and for Other Purposes. 89th Congress (1st Session) Senate Committee on Public Works. Special Subcommittee on Air and Water Pollution. April 9, 1965. 308 pp.

This document contains Government reports, statements made by Government officials and industrial representatives, and communications to Senator Muskie. The following topics are discussed: (1) photochemical smog; (2) effects of air pollution; (3) vehicle use trends; (4) recognition by state governments; (5) exhaust and crankcase emission control; (6) fuel evaporator loss control; (7) fuels; and (8) diesels. Also included are reports on causes and control of automotive emissions, by J.D. Caplan; and descriptions of visits to General Motors Research Laboratories, Ford Motor Co. Vehicle Emissions Testing Laboratory, American Motors Corp. (Air-guard system for exhaust control), and to Chrysler Corp. Laboratories (Clean air package components).##

00057

R.D. Kopa

PNEUMATIC FUEL ATOMIZATION AS APPLIED TO AUTOMOBILE AIR POLLUTION CONTROL. California Univ., Los Angeles, Dept. of Engineering.(Rept. No. 63-61.) Dec. 1963. 19p.
CFSTI, DDC: AD 601025

The principle of pneumatic fuel atomization as applied to internal combustion engine carburetion was conceived during research activity concerned with exhaust gas recycling and its effects on engine performance. The goal was to find a solution to thre engine "power surging" problem, a phenomenon resulting from exhaust gas recycling as a method of nitrogen oxide control. The test results were obtained during the operation of an engine equipped alternatively with a factory standard carburetor or with a fuel atomization device. The earlier developed exhaust gas recycling devices installed on engines equipped with standard carburetors were extensively road tested. They proved to operate trouble-free for test periods extended over 30,000 miles of driving. Nitrogen oxides reduction averaged 80% and the specific fuel consumption remained substantially unchanged. The fuel atomization device eliminates the "power surging" noticeable with the earlier recycling device, and since it combines the exhaust gas recycling with fuel-air mixture homogeneation, an additional benefit, namely, substantial reduction of unburned hydrocarbons and of carbon monoxide is obtainable. More research work, however, is needed in order to gain a conclusive picture about the full potential of pneumatic fuel atomization as a method of automotive air pollution control.##

00087

A.F. Bush, R.A. Glater, J. Dyer, G. Richards

THE EFFECTS OF ENGINE EXHAUST ON THE ATMOSPHERE WHEN AUTOMOBILES ARE EQUIPPED WITH AFTERBURNERS. California Univ., Los Angeles, Dept. of Engineering. (Rept. No. 62-63.) Dec. 1962. 38 pp.
   CFSTI, DDC: AD 297976

In order to determine the probable composition of the atmosphere aftrr automobile exhausts are controlled, tests were conducted using the air pollution test facility on the campus at UCLA. Automotive vehicles were studied with and without afterburners using various concentrations of auto exhaust during simulated driving cycles. The objective of the experimentation was to simulate ambient atmosphere and to trst this atmosphere for contamination by exposing known sensitized plants to it and testing its ability to produce human eye irritation. Indications are that atypical plant damage reported is due to oxides of nitrogen: Fumigations showed that, in all instances of elevated formaldehyde measurements, eye irritation resulted.##

00097

L.L. Winkstrom K Nobe

CATALYTIC DECOMPOSITION OF NITROGEN DIOXIDE. California Univ., Los Angeles, Dept. of Engineering. (Report 63-19.) Apr. 1963. 40 pp.
   CFSTI, DDC: AD 406834

Reactions of the oxides of nitrogen are of considerable interest in current air pollution research. The investigation reported in this paper is the study of the complete dissociation of NO2 in nitrogen and in air with CuO-Alumina (1:1) and CeO2-Alumina (1:1) catalysts. The initial concentration of the NO2 was varied within the range 720-2200 ppm. The reaction was studied in a steady-state isothermal flow reactor with the temperature varied in the range 304 - 520 C at gas space velocities (STP) ranging from 1,400 to 11,200/hr. It was observed that the kinetic data were best represented by the rate expression, r=ap / (1 plus bp). At low temperatures and high flow rates the rate reduced to a zero order reaction. Below 480 C the CuO had a higher catalytic activity than the CeC2. Above 480 C, however, the CeO2 had a higher activity. It was observed that there was considerable decomposition of NO2 even in excess air with CuO catalysts. Since it had been reportd previously that CuO catalysts were quite satisgactory for hydrocarbon oxidation, the results of this investigation indicate that both hydrocarbons and oxides of nitrogen may be simultaneously eliminated to a considerable degree with CuO catalysts. (Author)##

00131

H. F. Lund (Ed.)

INDUSTRIAL AIR POLLUTION. Factory 123, (10) 90-101, Oct. 1965.

A review of industrial air pollution problems and their solution is presented. The effectiveness of federal, state and local efforts on this problem, as well as the steps that industry has taken to control it, are discussed. Recommendations include: education of the public, a national planning program supported by industry, federal and state governments, federal legislation, less costly and more effective equipment for containing and preventing the nuisances.##

00269

V. H. Luther, K. Lohner, H. Muller, and W. Zander

POSSIBILITIES OF DECONTAMINATING EXHAUST GASES OF OTTO ENGINES. Moglichkeiten einer Entgiftung der Abgase von Ottomotoren. Erdoel Kohle (Hamburg) 18(12):964-972, Dec. 1965. Text in German.

The composition of motor exhaust gases is discussed. Measuring methods and the possibility of decontamination before, in, and behind the combustion chamber are described in detail. Fundamental principles of the Cleaner Air Package, crankcase blowby control devices, after-burner with spark ignition, and the Man-Air-Ox system are given. The state of the art of catalytic combustion is summarized and it is shown that the combination of other after-burner systems with small catalyst units are worthy of further development.##

00562

E. Hunigen and W. Prietsch

THE ELIMINATION OF NOXIOUS SUBSTANCES FROM INTERNAL COMBUSTION ENGINES. Probleme und Losungswege der Schadstoffbeseitigung bei Verbrennungsmotoren. Technik (Berlin), 21(6):377-383, June 1966.

Control of air pollution from internal combustion engine is reviewed. A table is given of maximum permissible concentrations of various components of exhaust gases for both Germanies, the USSR, and USA. The review emphasizes methods of measurement of various pollutants.##

00569

D. J. Addicott and J. G. Mingle

PARTIAL RECIRCULATION OF DIESEL ENGINE EXHAUST FOR REDUCTION OF OXIDES OF NITROGEN. Preprint. (Presented at Second Annual Meeting, Pacific Northwest International Section, Air Pollution Control Association, Portland, Oreg., Nov. 5-6, 1964.)

N oxides are formed in overlean regions during the heterogeneous combustion of the diesel engine. This paper describes a series of tests wherein up to 11% diesel engine exhaust gas was recirculated into the intake manifold. N oxides concentration, smoke, power, exhaust temperature, and fuel-air ratio are shown as a function of the percent of exhaust gas recirculated. The results of these tests show that the concentration of N oxides in the exhaust gas remained essentially constant, at 300 ppm, up to 8% of exhaust gas recirculation. The concentration then increased rapidly to 700 ppm at 11% of exhaust gas recirculation. Increasing the percent of exhaust recirculaton from zero to 11% caused the fuel-air ratio to increase from 0. 050 to 0. 065. As the percent of recirculated exhaust gas increased, so did the temperature of the recirculated portion of the exhaust increase. This increase of temperature is postulated to have increased the peak cycle temperature within the combustion chamber and thus increased the N oxides emission. It is further postulated that no reduction in N oxides emission will be obtained from recirculating exhaust gas unless the recirculated gas is cooled. The concentration of N oxides in the exhaust gas was determined with a spectrophotometer constructed at Oregon State University. (Authors' abstract) ##

00959

B. B. Sundaresan, C. I. Harding, F. P. May, and E. P. Hendrickson

A DRY PROCESS FOR THE REMOVAL OF NITROGEN OXIDES FROM WASTE GAS STREAMS IN NITRIC ACID MANUFACTURE. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper 66-96.)

Experimental studies were conducted using a commercial zeolite to remove NOx from waste gas streams in a nitric acid plant. NOx retained in the bed was recovered as enriched NOx and HNO3 gy regenerating the bed at elevated temperatures with hot air and/or steam. Test results indicate that such a system could be incorporated into an existing nitric acid plant, thereby eliminating release of significant quantities of NOx into atmosphere. The conclusions are enumerated below: (1) A process to remove NOx from the waste gas streams of nitric acid plants has been found; (2) Complete NOx removal as proved by this system will eliminate release of NOx into the atmosphere; (3) Commercial zeolite used in this process can remove NOx along with most of the moisture present in the tail gas; (4) NOx and H2O retained in the bed has been recovered as enriched NOx and HNO3 for possible feedback into the process stream; (5) It has been estimated that in a 300 ton acid plant by feeding back the recovered NOx into the process stream, about 4 to 5 tons per day of 60% HNO3 now being wasted could be added to production; and (6) The increased production should offset the additional investment for such a system, making the process economically feasible. (Author summary and conclusions) ##

01619

NITRIC ACID MANUFACTURE (INFORMATIVE REPT. NO. 5). J. Air Pollution Control Assoc. 14, (3) 91-3, Mar. 1964. (TI-2 Chemical Industry Committee).

Nitric acid manufacture by the ammonia oxidation process and the concentration process are described. The control aspects are discussed.##

01645

A. J. Haagen-Smit

THE CONTROL OF AIR POLLUTION. Sci. Am. 210, (1) 25-31, Jan. 1964.

Using the development of Los Angeles' control program as an example, smog, dust, fumes, photochemical reactions, automotive emissions, control methods, emissions standards, and control devices are reviewed.##

01646

B. Linsky

NEW METHODS OF REDUCING INDUSTRIAL AIR POLLUTION. Bldg. Res. 2, (5) 30-2, Oct. 1965.

New air pollution control methods, costs of control equipment, directions of current research, needs for additional research, and the need for collecting information are discussed.##

01701

P. Porter

THE ABATEMENT OR PREVENTION OF AIR POLLUTION FROM MOTOR VEHICLES AND SULFUR-CONTINING FUELS. Preprint. (Presented to the Ad Hoc Meeting on Technical Means of Abatement and Prevention of Air Pollution, at the Organization for Economic Cooperation and Development, Paris, France, Dec. 13-14, 1965.)

Progress in the United States in combatting two of the most ubiquitous sources of air pollution: emissions from motor vehicles, and sulfur compounds resulting from other kinds of fossil fuel combustion is reviewed. These are the two major sources for which technical means for abatement and prevention--technical means, that is, which are also economically feasible--have not yet been developed to our complete satisfaction.##

01791

G.A. Jutze R.J. Lewis

A METHOD FOR CHECKING INSTRUMENT PERFORMANCE AT REMOTE SAMPLING SITES. J. Air Pollution Control Assoc. 15, (7), 323-6, July 1965.

This paper describes a quality control technique used by the central headquarters operation of the continuous Air Monitoring Program in an effort to insure valid data production from instruments located at remote sampling stations. The procedure consists of preparation of 0.10 to 2.00 ppm mixtures of SO2 or NO2 in duplicate Mylar bags, each encased in a corrugated paper box. These mixtures are analyzed during make-up to insure duplication. One box is shipped to the field station where it is analyzed on-site. The control mixture is analyzed in the central lab at the same time. Correlation between measurements indicates the usefulness of this dynamic calibration check. The techniques used are described and results of the program are presented. (Author abstract)##

01850

J.A. Bolt M. Boerma

THE INFLUENCE OF INLET AIR CONDITIONS ON CARBURETOR METERING. Society of Automotive Engineers, Inc., New York, 1966. 13 pp. (Presented at the Congress of the Society of Automotive Engineers, Detroit, Mich., Jan. 10-14, 1966, Paper 660119.)

This paper provides data concerning the enrichment of automotive carburetors with variation of inlet air pressure and temperature. These changes occur with weather and the season, with altitude, and because of underhood heating. The early opening of the conventional carburetor enrichment value at altitude can add greatly to the "normal" carburetor enrichment. Means for compensating the mixture ratio for these changes in inlet air conditions are known, but will almost certainly add to the complexity and cost of the engine induction system. The cost of improved devices must be compromised with the possible reduction in exhaust emissions and improvement in fuel economy. (Author abstract)##

01854

R.S. Reid, J.G. Mingle, W.H. Paul

OXIDES OF NITROGEN FROM AIR ADDED IN EXHAUST PORTS. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, Society of Automotive Engineers, Inc., New York, 1966, p. 230-240. 6 refs. (Presented at the SAE Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966. Paper 660115)

This paper presents the results of a study made to examine quantitatively the oxides of nitrogen in the exhaust of an internal combustion engine installed in a passenger car. The effects of adding secondary air in exhaust ports, with both a rich and lean carburetor, and for steady-state conditions, are reported. Experimental setup and procedures are explained. (Authors' abstract)##

02051

J. Feist.

THE CATALYTIC REDUCTION OF NITROUS GASES DURING THE MANUFACTURE OF NITRIC ACID. Die Katalytische Reduktion Von Nitrosen Abgasen Sei Der Erzeugung Von Salpetersaure. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper VI/15). pp. 199-202.

Discusses a catalytic reduction process for reducing nitric oxide present in the waste gases from nitric acid for manufacture to a concentration of 100 ppm. Flow sheets illustrate thermal integration of the catalytic process with the overall process. Discusses the use of metal and ceramic catalysts. (Author abstract)##

02396

E. S. Monroe.

NEW DEVELOPMENTS IN INDUSTRIAL INCINERATION. Proc. Natl. Incinerator Conf. 226-30, 1966. (Presented at the National Incinerator Conference, American Society of Mechanical Engineers, New York City, May 1-4, 1966.)

The paper is a review of improved calculating and design techniques, performance rating of incinerators, and a description of the new open-pit incinerator. Of particular interest is a curve of nitrogen oxide formation with varying excess air and temperature developed from thermodynamic equilibrium data that has been verified by field tests. (Author abstract)##

02541

(SCIENTIFIC METHODS AND TECHNIQUES TO DECREASE THE POLLUTION OF THE ENVIRONMENT, THROUGH INHALATION OR INGESTION, AND OF ACOUSTICAL "NUISANCES.") Moyens scientifiques et techniques de diminuer la pollution des milieux inhales ou ingeres et des "nuisances" acoustiques. (Chapter 3: Les pollutions et "nuisances" d'origine industrielle et urbaine. Tome 1. Leur prevention et les problems scientifiques et techniques qu'elle pose en France.) Premier Ministre, Delegation generale a la recherche scientifique et technique. June 1966. pp. 47-59.

The functioning of chlorophyll in the course of photosynthesis in leaves of plants serves as a method of air purification of sufficient importance to consider its use in control. Vegetation, like men and animals, can sustain a considerable amount of damage to the point where the threshold limit of absorption of toxic substances is exceeded. The three gases causing the most damage to vegetation are carbon monoxide, the sulfur oxides, and those containing fluorine. Also to be considered are acid "smog", toxic "smog", ozone, and nitrogen oxides. Other industrial pollutants which have a toxic influence, but less sever and localized, are dusts, hydrogen sulfides, hydrochloric acid, etc. Ethylene and carbon monoxide cause great damage to the growth hormones, particularly auxin. The effects of SO_2, SO_3, and H_2SO_4 are related to the quanity of gas emitted, the degree of resistance of the species, their state of development, and the various environmental conditions. The sensitivity of vegetation to the action of sulfur gases varies essentially as a function of the speed of absorption of the gas by the leaves. Through experimentation it has been found that the plant species which are most sensitive to SO_2 are chickweed, alfalfa, barley, oats, wheat, rhubarb, lettuce, endive, spinich, cabbage, and tobacco. Apples, apricots, peaches, grapes, corn, and beans are less sensitive, whereas the floral species such as gladiolus, rose, and lilac offer considerable resistance. Aquatic vegetation is often used as purifying means for polluted streams. Subsoils purify themselves of pollutant materials in various ways, including uptake by vegetation and dispersion in the soil with rain water, etc. In a section on means of decreasing the inhaled pollutants the following are mentioned: dust collectors, normal methods of dispersion in the atmosphere, fumes from domestic fires, auto exhaust fumes, fuel additives, improvement of combustion in engines, recycling of crankcase gases, post-combustion appliances, and redesigning of motors. Also given in this section (Chapter 3) is some similar information on ingested pollutants and on problems of noise.##

02637

C. L. Goodacre

BRIEF SURVEY OF THE LITERATURE RELATING TO EXHAUST GAS CONTROL BY MEANS OF ENGINE MODIFICATION (PART III OF ATMOSPHERIC POLLUTION: A SURVEY OF SOME ASPECTS OF THE EMISSIONS FROM PETROL-ENGINED VEHICLES AND THEIR TREATMENT). British Technical Council of the Motor and Petroleum Industries, England. Sept. 1965. pp. 65-74.

An appraisal is presented of published work on: air-fuel ratio; ignition timing; power output and speed; value overlap; combustion chamber deposits; manifold vacuum; carburetion; combustion chamber shape; engine cycle variations; spark plugs and electrical equipment; and pressure fuel systems.##

02638

P. A. C. Fosberry

EXHAUST SYSTEM DEVICES FOR PETROL-ENGINED VEHICLES (PART IV OF ATMOSPHERIC POLLUTION: A SURVEY OF SOME ASPECTS OF THE EMISSIONS FROM PETROL-ENGINED VEHICLES AND THEIR TREATMENT). British Technical Council of the Motor and Petroleum Industries, England. Sept. 1965. pp. 75-92.

The major work on devices in exhaust systems has been on their use for the oxidation of hydrocarbons and carbon monoxide. A common feature of all these devices is that air is added to the exhaust stream in order to allow combustion to take place; 3 methods of combustion are used, leading to 3 types of devices: Catalytic converters, Direct flame afterburners, and Manifold air oxidation systems. Devices on which results have been published have almost exclusively been related to the requirements of the Californian legislation for the control of exhaust emissions; thus it is convenient to discuss performance where possible in relation to the requirements laid down by California. These requirements are broadly that in 12,000 miles of normal driving the average emissions (as measured during a specified driving cycle carried out at intervals in the 12,000 mile test) should not exceed 275 ppm hydrocarbon (measured as hexane on a nondispersive infra-red gas analyser) and 1.5% carbon monoxide; certain criteria including ones on reliability, noise, odour and safety are also stipulated. Five devices (4 catalytic and one direct flame) have been approved by the Californian M.V.P.C.B. as meeting their requirements; brief details of these devices and of their performance in the California tests are given. A lesser amount of work has been published on the reduction of oxides of N in exhaust gases. The present relative status of the different devices is discussed.##

03045

H. Mori

HANSHIN WET TYPE DUST COLLECTORS. Clean Air Heat Management (Tokyo) 15, (5) 5-11, May 1966

There are three models of Hanshin Wet Type Dust Collectors for collecting different kinds of dust and they all operate on the same principles. Contaminated exhaust gas is forced into a water tank equipped with turbulance control plates through nozzles at a high speed. The gas is cleaned while in contact with the water. The HJ model is for collecting fine particles from such materials as sand, cement, activated carbon and brick. The typical collection efficiency for various particle size distributions is approximately 99%. The HJS model is designed for use with oil and coal burners. The mechanics of this model are the same for the HJ models, but the HJS model requires the addition of a sludge tank. The concentration of soot in the exhaust gas is reduced by a factor of two. Appropriate sizes of HJS models for different boiler sizes are tabulated. HJG models are designed for the treatment of gaseous contamination in exhaust gas. They have the same structure as HJ and HJS models except that a de-mister is added at the top of the tank. The absorption efficiencies for H_2S, Cl_2, SO_2 and NO_2 are tabulated. The efficiency of 98.5% is obtained for H_2S by addition of NaOH to the tank water.##

03145

W. R. Calvert

AN ABSORBENT FOR PROVIDING CLEAN AIR IN SUBMARINES. Navy Marine Engineering Lab., Annapolis, Md. (MEL Rept. No. 340/66). AUG. 1966. 18 PP.
CFSTI AD 639 583

The components to be removed from the foul air of a submarine atmosphere include moisture, CO_2 and H_2, each in a range up to about 3% by volume, and lesser quantities of contaminations which are off-gases from men and materials. These latter include the halogenated hydrocarbons, other hydrocarbons, CO, sulfur gases, nitrogen compounds, etc, which are in high concentration at their originating sources but may average to only a few parts per million in the total atmosphere. Occasional situations may occur when much larger quantities of these components enter a submarine's atmosphere. In addition it is necessary to remove certain airborne solids and liquids (i.e., dusts, smokes, aerosols, haze, bacteria, viruses, etc). Since adsorbents separate gases and vapors and filter airborne solid and liquid particles from a foul air steam, their capabilities are broadly inclusive. Cocoanut shell carbon is the adsorbent now widely used by the U. S. Navy for vents, filters, gas masks, etc. MS 544 is a sodium aluminosilicate adsorbent which, recently, became a commercial product. It is able to withstand thermal treatment in air during repeated activation to desired adsorbency status. It flows easily . An air purification process may need easy flowing adsorbent. This material is an example of the inorganic adsorbents presently available. Investigation of adsorbents included comparison of active carbon with an active inorganic adsorbent (MS 544) for the removal of Freon-11, Freon-12, CO2, H2, moisture, and background gases and vapors from prepared streams of "foul air." Adsorption, various desorptions, and heat activation were programmed in tests to compare the two adsorbents. Pressure decrease and clean air purge effects are included. It was concluded that (1) MS 544 is a safer adsorbent than carbon in a regenerative process and will remove more unwanted components from foul air, (2) termination of throughput in an air-purification adsorbent process is dependent upon the nature of the gaseous components which are to be removed from foul air; (3) moisture is a principal adsorbate in an airpurification adsorption process; (4) heating is necessary for rapid desorption and for complete activation prior to subsequent adsorption in a regenerative air-purification adsorption process.##

03204

W. Ehnert.

THE BEHAVIOR OF NITRIC OXIDE DURING ELECTROSTATIC GAS PURIFICATION. Uber das Verhalten des Stickstoffmonoxids bei der elektrostatischen Gasreinigung. Brennstoff-Chem. (Essen) 9(7):273-274, Sept. 1966. Translated from German as JPRS R-8584-D.

The effects of field intensities, ionizing-electrode diameters, period of stay of the gas in the electrostatic purifier, concentrations of nitric oxide in the gas, and the presence of unsaturated compounds upon the decomposition of nitric oxide were measured by means of an experimental electro-filter situated in coke oven plant. Within the range of 3 to 3.8 kv/cm, the quantities of NO decline with increasing field intensity, this decline amounting to only about 10 to 20% at the field strengths of 2 to 3 kv/cm which are commonly used in coke-oven installations. Industrial-economic considerations however place a limit on the extent to which voltages can be increased in practice. The period during which the gases remain in the filter is a factor in the reduction of NO content, but a doubling of this period from 6 to 12 seconds results in a maximum increase in the decomposition rate of only 25%. The reduction in NO tends first to decline and then to increase as the diameter of the ionizing electrode is increased. The most effective factor in the reduction of NO contents is the addition of unsaturated compounds; thus the addition of 2.5 ml cyclopentadiene cu/m of gas increases the loss of NO by a factor of 4 under certain experimental conditions. The experiments show that current commercial coke-oven practice results in reductions of about 20% in NO content, and that an increase in the field strengths together with a rise in the unsaturated-compound contents can effect reductions of 50-60%.##

03536

AUTOMOTIVE AIR POLLUTION III. (A REPORT TO THE U.S. CONGRESS IN COMPLIANCE WITH PUBLIC LAW 88-206, THE CLEAN AIR ACT.) Preprint. 1965.

Reduced exhaust emissions of hydrocarbons and CO have become a reality in California with the introduction of the 1966-model passenger cars and light commercial vehicles. Recognition of the need for still further control measures is evidenced by the adoption of nitrogen oxide standards by the California Board of Health. The Department of Health, Education, and Welfare is implementing the new responsibilities and authorities conferred by the Motor Vehicle Air Pollution Control Act. Standards for the control of emissions from gasoline-fuelled vehicles are being developed accordingly, to become effective with the 1968 models. Some additional technical information has become available. Further studies of the effect of ambient temperature on exhaust emissions indicate that low temperatures tend to increase hydrocarbons and CO, particularly following cold-engine starts. Preliminary results obtained from a study of the effect of leaded fuels indicate that combustion chamber deposits may not significantly affect the quantities of hydrocarbons and CO emitted in exhaust gases. A survey being conducted to measure CO levels in urban communities suggests that human exposure to CO may be greater than routine atmospheric monitoring data had indicated. A number of new projects are being initiated by the Government to study the performance characteristics of production-type exhaust emission controls in varied environments, to develop more definitive data on exhaust emissions from small cars and diesel-powered vehicles, to learn more about human tolerance of lead and CO, and to effect control of oxides of nitrogen. An expansion of industry research in automotive air pollution and its control is indicated by the recent activities of technical associations. (Author summary)##

03983

H. F. Hartmann, G. M. Brown, B. R. Kean

USE OF CHLORINE DIOXIDE TO REDUCE VAPOUR PHASE GUM IN TOWN GAS. J. Inst. Fuel (London) 39, (307) 325-35, Aug. 1966.

Vapour phase gum, caused by the condensation of trace amounts of nitric oxide, oxygen, and diolefins has caused troublesome blockages of pilots and automatic control devices of gas appliances. This paper deals with the prevention of minimizing of gum in the gas by oxidation of the nitric oxide by chlorine dioxide. It is shown that chlorine dioxide will oxidize 95% or more of the nitric oxide, in concentrations of up to at least 24 p.p.m. in less thanntwo seconds, and that in favourable circumstances, gum formation will consequently be reduced to quantities too small to cause appliance complaints even though the reaction products are not removed. A considerable amount of control is necessary to make the process operate efficiently and successful application in any particular case will depend on the proper assessment of individual conditions. The protective measures outlined in the paper were instrumental in eliminating corrosion from the chlorine dioxide. (Author abstract modified)##

04618

P. A. Baker and R. C. Doerr

CATALYZED NITRIC OXIDE REDUCTION WITH CARBON MONOXIDE. Ind. Eng. Chem. Process Design Develop. 4, (2) 188-91, Apr. 1965. (Presented before the Division of Water and Waste Chemistry, 147th Meeting, American Chemical b8society, Philadelphia, Pa., Apr. 1964.)

The reductionof nitric oxide by carbon monoxide over a copper chromite catalyst from 115 to 270 C. and up to 1/36,000 hr. space velocity is discussed. Reduction of 90% at space velocities of 1/16,000 hr. is obtained at temperatures exceeding 200 C. At a given space velocity stepwise NO reduction is observed as a function of temperature. Partial reduction of NO to N2O takes place at low temperatures, followed by complete reduction to N2 as temperature increases. At 1/12,000 hr. inlet NO concentrations between 500 and 9000 p.p.m. do not effect reduction efficiency at temperatures exceeding 150 C. Excess CO has no effect. Water does not affect NO reduction but leads to ammonia formation. Oxygen if present preferentially oxidizes CO to CO2. There must be sufficient CO to react with the O2 as well as NO for effective reduction of the NO. This system has practical significance for NO removal from automobile exhaust. (Author abstract)##

04634

T. P. Varshavskii, A. M. Denisov, L. E. Zlatin, and K. V. Zolotarev

SMOKELESS CHARGING OF COKE OVENS. Coke Chem. (USSR) (English Transl.) (6) 26-31, 1965. Russ. (Tr.)

A pilot-commercial smokeless charging plant has been built on No. 1 battery at the Kemerovo Coke and Chemical Works along the lines of those at VUKhIN and the Magnitogorsk Integrated Iron and Steel Works. A new smokeless oven charging system has been devised and introduced on the No. 1 battery at the Kemerovo Coke and Chemical Works based on separate consecutive emptying of the charging-car hoppers (4,3,2 and 1) with suction of the charging gases only into the coke side collecting main. The possibility of the saleable tar being contaminated with ash or heavy tar products has been eliminated. 4.0 tons/day of high-ash tar was obtained from the coke side collecting main. The nitric oxide content of the raw gas from No. 1 battery is 16.5 cc/cu meter. Accordingly it is vital to solve the problem of how to remove the nitric oxide from the charging gases or how to isolate and utilize them without purification. The satisfactory operating results of the plant

enable this system to be recommended for works which do not supply gas to nitrogenous fertilizer undertakings. (Author conclusions)#
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04899

H. D. Daigh and W. F. Deeter

CONTROL OF NITROGEN OXIDES IN AUTOMOTIVE EXHAUST. API (Am. Petrol. Inst.) Preprint. (Presented at a Session on Automobile Exhaust Gas, 27th Midyear Meeting, American Petroleum Inst., Division of Refining, San Francisco, Calif. May 17, 1962.)

Large differences exist in the concentration of nitrogen oxides in the exhausts from different makes and models of vehicles and for different modes of vehicle operation. Maximum quantities of nitrogen oxides are emitted during high-speed cruising with large incremental increases occurring for each 10-mph increase in speed. Full-throttle acceleration is another mode of operation which causes the emission of large quantities of nitrogen oxides. Nitrogen oxides can be reduced by several methods. Modification of ignition advance and carburetion and changes in fuel composition reduced emissions but did not achieve the 80-percent reduction which was the goal of this investigation. However, the use of recycled exhaust gas was effective, and reductions of 80 percent or more were generally obtained. A modified system for recycling exhaust gas was developed which offers an operable, inexpensive method for reducing emissions of nitrogen oxides. Adequate vehicle performance was achieved by recycling the exhaust at elevated temperatures and by designing the system to shut off the flow at idle and wide-open throttle. Concentrations of carbon monoxide and hydrocarbons (the latter during deceleration only) were also reduced. Limited testing with this system did not reveal any adverse operating effects or abnormal deposit problems. The results indicated that moderate changes can be made in the ignition and carburetion of those vehicles requiring such changes with little sacrifice of nitrogen oxides reduction. Individual inert gases, such as nitrogen and carbon dioxide, were equally effective for reducing nitrogen oxides emissions. The effectiveness appears to be due to a modification of the combustion process resulting in lower peak temperatures. A thorough study of combustion should be made to identify those conditions influencing the combustion phenomenon and to determine the optimum conditions for reducing the concentrations of nitrogen oxides. (Author abstract)##

04962

R. G. Lunche, E. E. Lemke, R. L. Weimer, and J. A. Verssen

AIR POLLUTION ENGINEERING IN LOS ANGELES COUNTY. Los Angeles County Air Pollution Control District, Calif. July 1, 1966. 51 pp.

Los Angeles County, the largest heavily-industrialized, semi-tropical area in the world, is afflicted with a serious and well-publicized air pollution problem. This problem is accentuated by average wind speeds of less than 6 miles per hr., and temperature inversions on more than 260 days per year, which restrict dispersion of the air contaminants generated by the activities of seven million people. Since 1939 population has more than doubled, industry has expanded from approximately 6000 establishments to more than 20,000 in 1966, and automobile registration, gasoline consumption and fuels usage have increased sharply. In addition to nearly two decades of expenditures by the District for research engineering and enforcement, industry has expended during this same period 127 million dollars for the installation of new control equipment units and 882 million dollars for basic production equipment. This program is preventing some 5085 tons of various air contaminants from entering the Los Angeles atmosphere each day. Of this total, control measures of the petroleum industry are responsible for removing some 3425 tons. The prohibition of burning of high sulfur fuels accounts for another 535 tons. The ban on single chamber incinerators and open burning prevents another 605 tons from entering the atmosphere. The control of air contaminants from mineral and metallurgical industries accounts for another 420 tons. Of the 5085 tons of various air contaminants now prevented from entering the Los Angeles atmosphere from stationary sources each day, 1195 tons are hydrocarbons, 1320 tons are SO2, 1945 tons are CO, 470 tons are aerosols, and 155 tons are oxides of nitrogen. The program will not be complete however, until effective control over the gasoline-powered vehicle, fuel oil burning and organic solvent usage is carried out.##

05003

J. Fiala

HOW THE CZECHOSLOVAK SYSTEM OF CLOSED INLET AND EXHAUST CYCLE REDUCES THE HARMFUL EFFECT OF EXHAUST GASES PRODUCED BY INTERNAL COMBUSTION ENGINES. (Czech. Motor Rev.) 12, Sept. 1966.

Two automotive emission control systems employing recirculation are described. From the driver's seat normal engine operation can be changed into (1) a semi-open inlet and exhaust cycle with part of the gases recirculating or (2) a fully closed cycle with the engine working independent of the surrounding atmosphere without emissions and at low noise level. The catalytic chamber also used with the semi-open system weighs 0.86 kg per liter for engines up to 40 liters operating at up to 2000 rpm. The service life of the catalyzing charge is about 14 months depending on the way the vehicle is used. The chamber's dimensions are 500 mm x 300 mm x 350 mm. Its efficiency is up to 98% for CO, 95% for aldehydes, 50% for NOx, while no traces of SOx have been found in the adjusted exhaust gases. The closed cycle system brings the exhaust gas mixture to a regenerator chamber at 160 C where oxygen and hydrogen are generated from the carbon dioxide and water vapor. The engine cylinders are charged with the oxygen, hydrogen and unburnt residues at about 3 kg/sq cm without supercharger. The light component of the fuel with high fixed oxygen content is atomized in the induction manifold of the engine. The heavy component of the fuel with high hydrogen and carbon contents is injected under high pressure directly into the cylinders. The superoxides of sodium, barium, or even lithium may be employed in the regenerator. To make the adjusted gas mixture richer with oxygen a solid pyrochemical source of oxygen may be employed, for example a mixture of lithium perchlorate with extra fine metal manganese and lithium peroxide. Lithium peroxide oxidizes the manganese and is a catalyzer making heat decomposition of the lithium perchlorate possible and preventing the escape of free chlorine. The mixture in the shape of pressed bricks is equivalent in volume to liquid oxygen and can be made to operate by an electic ignitor. With the use of two-component fuel and the closed cycle system a longer time for the mixing of fuel in the working gas mixture and improvement of the combustion in the engine cylinders is obtained. Due to this the impact load on the crankshaft mechanism in the internal combustion engine will be reduced and silent running of the engine obtained.##

05048

G. H. Peters, J. E. Aker, and E. F. Morello

A SOLID CHEMICAL AIR GENERATOR. Amoco Chemicals Corp., Seymour, Ind., Propellants Div. (Rept. No. AMRL-TDR-64-71.) Sept. 1964. 55 pp.

The development of a solid chemical air generator capable of producing a breathable, oxygen enriched atmosphere for possible space applications, was investigated. The direct decomposition of solid ammonium nitrate to produce the desired atmosphere was studied. This direct method of conversion was found to be impractical as the reaction products consisted of nitrogen oxides regardless of the conditions of decompostion. Various catalyst systems for decomposition of nitrous oxide were investigated since the reaction products contained about 40% of this gas and results indicated this gas could be controlled. Screening of various catalyst systems produced nickel oxide, 0.5% rhodium on alumina, 0.6% platinum on alumina, and cobalt oxide catalysts - all capable of completely decomposing nitrous oxide at high flow rates. The level of nitrous oxide in the reaction products could not be increased sufficiently to provide the desired oxygen level, and it was necessary to decompose the nitrogen dioxide present in the reaction gases. Catalyst systems based on barium oxide and sodium silicate were developed which decomposed pure nitrogen dioxide but were found to be partially deactivated by water formed in the ammonium nitrate decomposition. The oxygen level in the gas was increased to approximately 12% (36% of theoretical). A compact unit was developed that was capable of decomposing solid ammonium nitrate at a controlled rate on demand and partially converting the gases to provide an atmosphere containing about 12% oxygen.##

05064

R. A. Baker, Sr. and R. C. Doerr

CATALYTIC REDUCTION OF NITROGEN OXIDES IN AUTOMOBILE EXHAUST. J. Air Pollution Control Assoc. 14, (10) 409-14, Oct. 1964.

The technical feasibility of using copper-containing catalysts to reduce oxides of nitrogen (NOx) in leaded automobile exhaust has been demonstrated. Forty-four catalysts were screened and the parametric effects (concentration, temperature, space velocity) developed for the most promising materials. One of the most promising was a laboratory-developed copper oxide-cobalt oxide -alumina catalyst which promoted greater than 90% NOx reduction of 1500 ppm concentration after 350 hours exposure to leaded exhaust at 10,000/hr space velocity and approximately 500 C. This same catalyst retained its activity after exposure to air for eight hours at temperatures of 870 to 1000 C. This indicates it will retain activity if overheating occurs as a result of high speed driving. Design calculations based on this laboratory -developed material show that a device containing 0.1 cu ft (12 lbs.) of the catalyst, placed near the manifold of the automobile exhaust system, would remove about 86% NOx without thermal overload or supplemental air systems. (Author conclusions)##

05082

TWO MECHANICAL DEVICES ATTACK THE CAUSES OF SMOG. Prod. Engr. 38, (6) 22-4, Mar. 15, 1967.

The problem of polluted air in most metropolitan areas is the result of automotive exhaust products. The development of 2 new mechanical rather than catalytic smog control devices are the nitric oxide reduction system, NOR, which meters the exhaust from a car engine and recycles it for further combustion, and vehicle vapor recovery system to prevent unburned gasoline from escaping by evaporation. The new devices reduce or eliminate the emissions. Company tests, nitric oxide reduction system, and the vehicle vapor recovery system are discussed.##

05149

W. F. Hamilton, M. Levine, and E. Simon

SMOG ABATEMENT. Lockheed Aircraft Corp., Burbank, Calif. (Dec. 1, 1959). 48 pp. (Rept. No. 14163.)

Techniques were developed for simulating typical smog polluted atmospheres. Methods and materials for reducing or preventing smog formation as measured by ozone level were studied. Several classes of materials were found effective in various degrees. Best results were obtained by direct addition of iodine to polluted atmospheres. Additions were effective both prior to smog generation by irradiation or after smog formation occurred. Attempts to introduce inhibiting materials in gasoline through an internal combustion engine were unsuccessful. (Author abstract modified)##

05151l

B. A. Kerns

CHEMICAL SUPPRESSION OF NITROGEN OXIDES. Westinghouse Electric Corp., Pittsburgh, Pa., Headquarters Mfg. Lab. (1964). 6 pp.

An approach to NO and NO2 fume control by eliminating the fumes before their release from pickling, milling and bright dipping solutions was investigated. Since classical chemistry shows a reaction between most primary amines and the oxides of nitrogen, a study of an available, inexpensive, and readily adaptable amide, urea, was undertaken. The investigations included a thorough study of the urea-nitric acid-nitrogen oxides reactions for both copper and iron-68 analyses of the urea (for purity), and of the evolved gases; and the effect of the urea-nitric acid system on the various types of stainless steels and other metals which could be employed. A thorough study of the possible hazards of the urea-nitric acid system was undertaken also . In the case of chemical milling urea sucessfully lowered the NO2 fumes to almost undetectable levels, but this treatment did not suppress the HNO3 vapors which coincidentally are released from these hot chemical milling solutions. Thus a small water scrubbing apparatus is still required to prevent these vapors from being released to the atmosphere. The use of a HNO3-urea solution system produces a satin finish in less than half of the time now required to bright dip and release no toxic fumes to the atmosphere.##

05153

R. D. Kopa, R. G. Jewell, and R. V. Spangler

EFFECT OF EXHAUST GAS RECIRCULATION ON AUTOMOTIVE RING WEAR. California Univ., Los Angeles, Dept. of Engineering and Richfield Research and Development Center, Anaheim, Calif. (Apr. 1961). 39 pp. Rept. 61-20.) (Published in J. Air Pollution Control Assoc. 12 (5), 246-54 (May 1962).)

The effect of exhaust gas recirculation on the wear of automobile engine piston rings was investigated by means of the radioactive isotope tracing method. The experiments were performed on a test facility specially designed for evaluation of lubricating oils, fuels and additives, for their effect on piston ring wear. The piston ring wear rate was recorded during a series of experiments at different engine operating conditions and various amounts of exhaust gas recycling. At the same time, all engine parameters were recorded and the brake specific fuel consumption determined. The exhaust gas was analyzed for the nitrogen oxides content. When 12% of exhaust gas was recycled into the inlet manifold the following results were obtained: 1) a 95% reduction of ring wear at a steady state engine operation, 2) a 50% reduction of ring wear when the engine was operated on a simulated traffic pattern, 3) a 60 to 80 % reduction in nitrogen oxides in the exhaust gas, 4) a 5% increase in the brake specific fuel consumption. An attempt was made to explain experimentally and theoretically, the surprising ring wear reduction resulting from the use of exhaust gas recirculation. This report also presents the description of the experimental facility. (Author abstract)##

05217

A SIMPLIFIED CONTROL SYSTEM FOR NITROGEN OXIDES IN VEHICLE EXHAUST. Arco Chemical Co., Anaheim, Calif. Feb. 8, 1967. 17 pp. (Also published as 90th Congress ("Air pollution--1967, Part I (Automotive Air Pollution)" Hearings before the Subcommittee on Air and Water Pollution of the Committee on Public Works, U.S. Senate, Feb. 13-14, 20-21, 1967, pp. 369-85.)

Exhaust gas recirculation is an effective method for controlling nitrogen oxides in vehicle exhaust. A system has been developed for practical application to the present day automobile. The N-O-R System offers an attractive approach for controlling nitrogen oxides because it is: 1) effective - reducing nitrogen oxids
oxides by 75% to 85%; 2) simple in design; 3) can be fabricated from readily available materials; 4) located internally and does not contribute to congestion under the hood; 5) requires little or no maintenance; and 6) can be designed as an integral part of the engine at the time of manufacture. (Author summary modified)

05309

E. C. Betz and H. J. Feist

CATALYTIC AFTERBURNING OF ORGANIC AIR POLLUTANTS. Technik (Berlin) 20 (6), 395-400 (June 1965). Ger. (Tr.)

Newly developed all-metal catalysts are discussed which are designed on the basis of the building block assembly system; in practice, they achieve an average running time of 25,000-35,000 working hours. A catalyst, which speeds up a reaction because of its presence, without itself participating in the reaction, reduces the decomposition temperature during combustion. A reaction temperature of 250-350 C was achieved with all-metal catalysts developed for catalytic exhaust gas purification. The cold exhaust gases flow through a heat exchanger and are preheated. Then they are heated by means of oil burners, gas burners, or electrical heating elements until they reach the catalytic reaction temperature. A fan then moves the exhaust gases to the catalyst where the irritants are oxidized. The heat released during catalytic combustion is largely recovered in the heat exchanger and it is used for heating the cold exhaust gases as combustion here is exothermal. At a reaction temperature of about 250-350 C, all combustible components are oxidized in the exhaust gas. As a result of the temperature increase in the exhaust gas in the catalyst, the positive heat change of this reaction can measured which gives a figure directly proportional to the irritant concentration. The catalytic exhaust gas purification unit thus serves as a measurement instrument for the concentration of the exhaust gas. A measurement system used for continual surveillance is presented in diagram. Applications of catalytic afterburning are discussed in relation to the following: drying and hardening processes, phthalic acid and maleic acid anhydride production, nitric acid production, NO/NO2 reduction.##

05380

Knopp, H. E. U. Joachim, and G. Baumann

THE INFLUENCE OF GASOLINE INJECTION ON THE EXHAUST GASES OF MOTOR VEHICLES. (Beeinflussung der Kraftfahrzeugabgase durch Benzineinspritzung.) Motortech. Z. (Stuttgart) 26, (9) 353-61, Sept. 1965 and Bosch Tech. Ber. 1 (4), 206-20, (Sept. 1965). Ger. (Tr.)

The emission of carbon monoxide, hydrocarbons and oxides of nitrogen from various engines with intake-manifold fuel-injection systems, and in some cases from their carburetor equipped counterparts, was measured. Under steady running conditions, a fuel injection system offers advantages by making possible to adopt the characteristics from poin to point to obtain the most favorable exhaust conditions. This adoption is described for both a mechanically and an electronically controlled injsection system. Fundamental advanatages are obtained with a fuel-injection system under non-steady running conditions, during acceleration and on the overrun. A great influence of engine design on hydrocarbon emission is detectable. Gasoline intake manifold injection offers a sure way of meeting the current requirements of the California test of a CO content of 1.5 percent by volume. If the limit is going to be reduced to 1.0 percent as of 1970, as has been announced then it would seem possible to stay within this value through additional efforts. As shown in the examples of the small and the large engine, it is possible to fulfill the current hydrocarbon requirements of the test, provided the engine design takes into account the demands made on the exhaust gas. The NO2 emission behaves exactly in an opposite fashion to the CO and hydrocarbon emissions, because it is at a maximum when the other components reach minimum values. At the present state of our knowledge it is not possible to influence this through the mixture. It is fortunate that the percentage of nitrogen oxides at low partial load values of the California cycle is low. In principle it makes more sense to provide maximum combustion completion for the fuel in the combustion chambers, rather than to install afterburners. Injection offers the additional advantage of smaller fuel consumption and larger rotational momentum.

05401

ATMOSPHERIC EMISSIONS FROM NITRIC ACID MANUFACTURING PROCESSES. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution and Manufacturing Chemists Association, Washington, D.C. 1966. 96 pp. (999-AP-27.)

Emissions to the atmosphere from the manufacture of nitric acid were investigated jointly by the Manufacturing Chemists' Assoc., Inc. and the U.S.P.H.S.; the study was the second in a cooperative program for evaluation of emissions from selected chemical manufacturing processes. The report describes the growth and potential of the nitric acid industry, the principal processes for production of nitric acid, process variables, emissions from plants under normal operating conditions, and the methods and devices used to limit and control emissions. The sampling and analytical techniques by which emissions were assessed are presented in detail. (Author's abstract)##

05822

A. C. Stern

PROSPECTS FOR EXHAUST CONTROL BY ENGINE MODIFICATION. Preprint. (Presented at the Research Conference on Motor Vehicle Exhaust Emissions and Their Effects, Los Angeles, Calif., Dec. 7, 1961.)

Automotive research is much needed on internal combustion engines designed to reduce pollution emissions from their operation. If progress is to be made toward the smog-free

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automobile, a new sense of mission and a lot more fiscal support has to be given and competent researchers have to be encouraged to undertake the work. Although we cannot predict the results of research, the several possible approaches which are available lead one to be optimistic as to the probability of achieving reduction in exhaust emissions by engine design modifications.##

05857

D. H. Barnhart and E. K. Diehl

CONTROL OF NITROGEN OXIDES IN BOILER FLUE GASES BY TWO-STAGE COMBUSTION. J. Air Pollution Control Assoc. 10 (5), 397-406 (Oct. 1960). (Presente at the 52nd Annual Meeting, Air Pollution Control Association, Los Angeles, Calif., June 21-26, 1959.)

Two-Stage Combustion with auxiliary-air ports above the burners is an effective method for controlling the nitric oxide concentration in boiler flue gases while still maintaining acceptable boiler performance. While utilizing this method of operation, with 95% of the combustion air through the burners, the nitric oxide level was reduced nearly 30% with both oil and gas firing. A reduction of 47% occurred during full-load oil firing when the air flow through the burners was 90%. The principal gains made in bringing nitric oxide under c ntrol are summarized. Two-Stage Combustion together with monor changes to the burner (approach-cone vanes out and air registers wide open) has given a total nitric oxide reduction of 56% when firing oil at full load. As mentioned previously, similar results can be expected in gas firing. It appears that additional reductions in nitric oxide would be possible if the air flow through the burners were reduced another 5 or 10%. The limit would be reached when combustibles (carbon, CO, etc.) were detected at the furnace outlet, or when the burners became unstable. The Southern California Edison Company put the Two-Stage Combustion Method into extended test operation at their El Segundo Steam Station. Although the fuel-air mixing process requires careful balance between rapid mixing for best combustion, and delayed mixing for nitric oxide reduction, the change has not required expensive equipment nor has it involved any extensive alterations to the boiler. This method of burning has also been incorporated in the design of two new boilers for Edison's Mandalay Station and two for their Huntington Beach Station. Two-Stage Combustion is believed to be a practical operating method for the control of nitric oxide emission from large gas- or oil-fired boilers. (Author summary modified)##

05894

N. A. Richardson and W. C. Middleton

EVALUATION OF FILTERS FOR REMOVING IRRITANTS FROM POLLUTED AIR. Heating, Piping, Air Conditioning 30, 147-54 (Nov. 1958). (Presented at the Meeting of the Chapters Regional Committee for Region 4, American Society of Heating and Air Conditioning Engineers, Los Angeles, Calif., May 6, 1958.)

Two air-filter media were evaluated by their effectiveness in reducing human sensory irritation resulting from Los Angeles smog. The sensory response of one group of subjects working in a filtered atmosphere was compared with the response of another similar group working in a non-filtered atmosphere in identical, adjacent rooms. Sensory response was measured daily and simulaneous measurements of the physical composition of the air were obtained. Mcuh of the testing was with activated carbon filters varying in air detention time between 0.032 and 0.0030 sec. A significant decrease in irritation was recorded over the entire range of air detention times. Differences in effectiveness with respect to air detention time were not statistically significant, although a trend of decreasing effectiveness was observed as air detention time was reduced. Effectiveness of activated carbon in removing oxidants was directly related to detention time. NO2 was reduced by activated carbon during its early use. A particulate filter which effectively removes particles having a diameter less than 0.05 microns was also tested. No decrease in sensory irritation was detected. Correlations computed between measurements taken in the non-filtered atmosphere indicate that sensory irritation is highly related to oxidant level and moderately to temperature. (Author's summary)##

05968

N. A. Richardson, W. C. Middleton, J. D. Isherwood, and B. Junge

AN INVESTIGATION OF SYSTEMS FOR REMOVING IRRITANTS FROM POLLUTED AIR. (In: First report of air pollution studies.) ((California Univ., Los Angeles, Dept. of Engineering.)) (Rept. No. 55-27.) (July 1955). 34 pp.

A study has been initiated to determine the effectiveness of various types and combinations of filtering devices for removing the irritants from polluted air. Because the irritants in "smog" have not been identified, the performance of these systems will have to be evaluated directly in terms of human response. For this purpose, a questionnaire which assesses human sensory response to an air environment has been designed and tested. Filter effectiveness can be evaluated by measuring the sensory response of a group of test subjects to a filtered environment and comparing it to the sensory response which the same test group would exhibit in the absence of the filtering unit. The latter response must be ascertained by measuring the concentration of certain selected chemical substances at the filtering system inlet and relying upon a correlation between group response and the concentration of these chemical "indicators." The sensory response of three test groups to an unfiltered air environment was being compared to several chemical and physical measurements in order to establish correlations for use in filter evaluation. Preliminary results suggest that oxidant concentration as measured by a phenolphthalein reaction may serve as a good "indicator" of the severity of "smog" irritation. (Author abstract modified)##

06144

Hirao, O.

PROBLEMS OF AIR POLLUTION DUE TO VEHICLE EMISSIONS GASES. J. Japan Soc. Mech. Engrs. (Tokyo) 69,575, 1568-72, Dec. 1966. Jap.

The reduction of air pollution due to automotive exhaust is estimated to cost the Japanese tax payer $42 million. Likewise, a great expense will be incurred in correcting pollution from steam power plants. Automobile exhaust causes pollution in local areas such as heavy traffic circles. The harmful effects of such pollutants as CO, SO2, NO, hydrocarbonds, formaldehyde, and dusts are discussed, expecially pollution due to CO. A supplement of secondary air to convert CO to CO2, and the even distribution of gases to the cylinders would be useful in cutting pollution. The production of various hydrocarbons by the engine is tabulated. Another possible method for lessening the concentration of automotive emissions would be in construction of over- and underpasses to avoid bottlenecks on the highway. This method would be cheaper than design and installation of engine modifications for each car. For example, it is estimated that it would cost $900 million per year for cars in the United States to be properly equipped to control automotive emissions, which money could more favorably be used in carefully designed construction of 3000 miles of highway.

06277

(Army Chemical Center, Edgewood, Md.) (Technical Documentary Rept. No. SSD-TDR-62-177.) (Nov. 1962). 14 pp.

A TEST SERIES CONDUCTED TO DETERMINE THE FEASIBILITY OF USING WATER FOG OR A THERMAL UPDRAFT TO CONTROL OR DISPERSE THE FUMES RESULTING FROM SPILLS OF NITROGEN TETROXIDE.

The object of the work described in this report was to test and evaluate two different methods of preventing large, concentrated clouds of nitrogen dioxide from traveling for extended distances at ground level. These clouds of nitrogen dioxide are the fumes which are generated from spills of nitrogen tetroxide. Since these tests were designed as a feasibility study only, no attempt was made to collect data; therefore, the results described in this report are strictly qualitative. The test results obtained indicated that the water fog system and the thermal updraft system are feasible and show much promise as effective methods for controlling fumes resulting from the spillage of liquid propellants.##

06379

L. D. Decker

INCINERATION TECHNIQUES FOR CONTROLLING EMISSIONS OF NITROGEN OXIDES. Preprint. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967, Paper No. 67-148.)

Three commercially available incineration systems for eliminating nitrogen oxides are described. The first system incorporates the use of a two-stage catalytic reactor and employment of natural gas as a reducing fuel to totally reduce to nitrogen the oxides evolved from a nitric acid plant. The second type of incineration system incorporates the use of a carbon bed to smooth out the cyclical release of oxides such as from a lamp filament core-dissolving operation, and selective catalytic reduction using a hydrocarbon fuel to reduce the oxides to nitric oxide. The third system completely reduces the oxides evolved from closed-reactor nitration-type processes. In this system, the oxides are used as the oxidizing agent in a direct flame reduction burner and the residual oxides are further reduced by a catalytic clean-up step.##

06778

(INDUSTRY AND ATMOSPHERIC POLLUTION IN GREAT BRITAIN.)
Industrie et pollution atmospherique en Grande Bretagne.
Centre Interprofessionnel Technique d'Etudes de la
Pollution Atmospherique, Paris, France. (1967.) 6 pp. Fr.
(Rept. No. CI 310.) (C.I.T.E.P.A. Document No. 24.)

A summary of the basis of governmental action in Great Britain in the struggle against industrial emissions is outlined. The regulations imposed by the "Alkali Act" are in most cases based on "the most practical means." Standards are given for chimney heights. Statutory limits are given for various materials emitted such as hydrochloric acid, sulfuric acid, nitric acid, hydrogen sulfide, chlorine, arsenic, antimony, cadmium, and lead. The construction of tall buildings tends to reduce the benefits obtained by tall chimneys. A better knowledge of the effects of pollutants should be obtained so as not to burden industry with unnecessary expense in their control. It is urged that international standards for emission be adopted.##

06838

A. F. Meyer, Jr.

AIR POLLUTION CONTROL IN THE DEPARTMENT OF DEFENSE. Preprint. (1964).

As part of the over-all systems management procedures for development and procurement of weapons systems, special attention has been given by the U.S. Air Force to the health hazards protection requirements associated with Air Force missile and space booster systems. As part of the mandatory programs, the possibility of environmental contamination of installations and adjacent civilian communities must be investigated. Directives have been issued by the military services specifying procedures to be followed from initiation of a concept involving use of potentially hazardous materials through ultimate use and disposition (Exhibits C through E). The role of the Advisory Center on Toxicology is defined, and the means whereby military agencies obtain prompt advice and assistance outlined. These directives also provide for the various services' methods of providing operational preventive measures, and those relating to their systems development programs. Actual launches from operational strategic missile sites are not conducted except in event of war operations. The principal air pollution hazards at operational missile sites arise from the possibilities of release of vapor from fuels or oxidizer during propellant transfer operations, or as part of missile maintenance procedures. In the case of the Titan II weapons system, the propellants are a mixture of unsymmetrical dimethylhydrazine and hydrazine (aerozene 50); and nitrogen tetroxide. These do constitute personnel hazards. Both are toxic and can be involved in pollution of the air. The Minuteman system uses solid propellants and no potential air pollution problem from that source exists at operational bases. Part of the initial site activation procedures for these weapons systems included the collection of numerous environmental samples to determine the existing physical, chemical, and biological conditions of the site and adjacent areas. During propellant transfer operations qualified environmental specialists of the Medical Service and safety technicians are present with appropriate propellant vapor detection devices.##

06844

H. C. Anderson, P. L. Romeo and W. J. Green

A NEW FAMILY OF CATALYSTS FOR NITRIC ACID TAIL GASES. Engelhard Ind. Tech. Bull. 7 (3), 100-5 (Dec. 1966).

The palladium unitory ceramic catalyst remove oxides of nitrogen from tail gases produced during the production of nitric acid was evaluated. The new catalyst, provides excellent abatement at 100 p.s.i.g., using space velocities of 100,000. Even at 150,000, 94% of the NOx was removed, with ammonia in only slight excess over the NOx. Bench-scale and field experience have shown that the unitary ceramic catalyst is well adapted to the treatment of nitric acid stack gases.##

06867

M. T. Dmitriev

EFFECT OF IONIZING RADIATION ON THE COMPOSITION OF THE AIR WITHIN A FACTORY. (Vliyanie ioniziruyushchei radiatsii na sostav vozdukha proizvodstvennykh pomeshchenii.) Hyg. Sanit. (Gigiena i Sanit.) 30 (4), 44-50 (Apr. 1965). Russ. (Tr.)

A study was made of the efficiency of the processes leading to the production of nitrogen oxides and ozone in the air under the action of ionizing radiation and neutrons. A comparison of the data obtained with concentrations of nitrogen dioxide and ozone gases, formed in the air under natural conditions, made it possible to set the maximum permissible doses of ionizing radiation and that of the integral neutron current in the air of industrial premises. The following values of the permissible absorbed dose and the integral neutron flux were obtained 530 r and 1.0x10 to the 12th power neutr./cc for O3 and 70,000r and 1.3x10 to the 14th power neutr./cc for nitrogen oxides. These values for the maximum permissible absorbed doses and the integral neutron fluxes may be used as initial data for determining the capacity of ventilation installations in factories where the personnel are subjected ot irradiation. Safe entrance into the room after the termination of irradiation (when the radiation source has been automatically removed into a special well) will be ensured by a ventilation factor of 36 during the period of irradiation, at a typical mean dose rate of 10 r/sec. If the volume of the roomsis, for example, 150 cu m, the rate of the removal of air should not be less than 1.5 cu m/sec.##

06877

A. I. Steznenskii and O. A. Zagorovskii

POLLUTION OF THE URBAN ATMOSPHERE BY NITROGEN OXIDES. (K voprosu o zagryazenii atmosfery gorodov okislami azota.) Hyg. Sanit. (Gigiena i Sanit.) 30 (6), 408-10 (June 1965). Russ. (Tr.)

The emission of nitrogen oxides and a possible measure for reducing NO2 content in the flue gases discharged by the gas turbine were discussed. Nitrogen dioxide content in flue gas of different installations are compared and the highest NO2 content is found in combustion products discharged by the gas turbine. The most practicable and efficient method for reducing the production of NO2 is the reduction of the cooling (quenching) rate of the combustion product by lengthening the gas line leading from the combustion chamber to the turbine and by a gradual feeding of secondary air through a series of holes arranged at uniform intervals along the entire length of the gas line.##

07093

REVIEW OF RESTRICTING GAS EMISSION FROM NITRIC-ACID PLANTS. ((VDI (Verein Deutscher Ingenieure) Kommission Reinhaltung der Luft, Duesseldorf, Germany,)) (VDI No. 2295.) (July 1963) Ger. (Tr.) 12 pp.

The control of nitrogen oxides during the production of nitric acid was discussed. Nitrogen oxides emissions are restricted by absorption, suitable discharge outlets, and on the basis of imissions. Because of the particularities of nitrous gases, the content of the waste gases cannot be completely controlled.##

07552

Billings, Charles E., Charles Kurker, Jr., and Leslie Silverman

SIMULTANEOUS REMOVAL OF ACID GASES, MISTS, AND FUMES WITH MINERAL WOOL FILTERS. J. Air Pollution Control Assoc., 8(3):195-202, Nov. 1958. 20 refs. (Presented at the 51st Annual Meeting, Air Pollution Control Assoc., Philadelphia, Pa., May 26-29, 1958.)

Investigations have indicated that two in. thick filters at four lb/cu. ft. packing density will remove up to 80% of acid mist and up to 99% of acid gases and fumes. Total filter life depends upon concentration of contaminant in the entering air. A summary of filter performance is given. Estimated operating life based upon one use of the filter material can be obtained from the data given. With particulates such as iron oxide and fly ash, it has been found possible to wash and reuse filters about ten times. When iron oxide was collected simultaneously with SO2, filters were reused about eight times. Acid gas collection is significantly improved by the presence of moisture on slag wool filters. Mineral wool filters have several features such as, low cost (about 1 cents/lg.), small fiber diameter (4 micron and ability to withstand high temperatures (1000 deg F.). Slag wool will simultaneously remove sub-micron particulate materials with 90 to 99% efficiency. Resistance to flow through two in. slag wool filters (with an HF efficiency of 95%) is on the order of one or two in. of water, or if continuously moistened, at most 6 in. of water.##

07554

Donahue, J. L.

SYSTEM DESIGNS FOR THE CATALYTIC DECOMPOSITION OF NITROGEN OXIDES. J. Air Pollution Control Assoc., 8(3):209-212, 222, Nov. 1958. 6 refs. (Presented at the 51st Annual Meeting, Air Pollution Control Assoc., Philadelphia, Pa., May 25-29, 1958.)

The control of exhausts from industrial and chemical operations containing harmful concentrations of nitrogen oxides is accomplished by catalytic reduction of the gases. Catalytic destruction of nitrogen oxides, system designs currently in use on industrial applications, and operating performance are discussed. By mixing a hydrocarbon, or reactive fuel with the gases, and passing them through a catalyst, the end products are odorless, color-free, and harmless gases. Catalytic reduction of nitrogen oxides can be accomplished at either atmospheric or elevated pressure. The main components are the preheater, exhaust fan, and catalyst bed. As the process waste gases enter the system, they become mixed with and preheated by the recycled portion of the stream. The combined stream then passes the preheater. Following this, the reducing fuel is sparged into the system, and the combined stream enters the exhaust fan, is thoroughly mixed, and discharged through the catalyst element. Here, the oxidation of the sparge fuel and reduction of the nitrogen oxides takes place, with heat release in proportion to the sparge fuel supplied. For elevated pressures designers now incorporate a Catalytic Pressure Reactor, installed between the process tail gas outlet and the expansion turbine. A dual result is thus obtained; the catalyst reduces the oxides of nitrogen to produce a clear, clean, effluent, and the power recovered through the turbine is increased many times by the greatly elevated temperature of the gases. To date, there have been no reports of personnel discomfort, or corrosion attributed to exhaust streams whose oxides of nitrogen content has been reduced by processing in a catalytic system. In every case, users report complete elimination of the characteristic color and odor, which are otherwise strongly in evidence.##

07613

Ridgway, S. I. and J. C. Lair

AUTOMOTIVE AIR POLLUTION: A SYSTEMS APPROACH. J. Air Pollution Control Assoc., 10(4):336-340, Aug. 1960. 1 ref. (Presented at the 52nd Annual Meeting, Air Pollution Control Assoc., Los Angeles, Calif., June 21-26, 1959.)

The application of systems engineering to the control of pollution from automotive exhaust is illustrated. First, the design and complex mechanical function of the flame afterburner system are analyzed. The efficiency of the device is discussed. Secondly, an analysis is made of the natural meteorological modulation of the concentration of air pollution to form an estimate of the results that might be brought about by the control of emissions. By examination of past records, September was found to be the worst month of the smog season. Concentrations of ozone and carbon monoxide for the month of September from 1955-1958 were studied. It was deduced, on the basis of analysis, that a pollutant which contributes to smog formation must be reduced in concentration by a factor of 2 or 3 in order to reduce the worst September experience to the level of the best. The efficiency of control devices required to reduce today's pollution is calculated.##

07881

Grumer, J., M. E. Harris, V. R. Rowe, and E. S. Cook

EFFECT OF RECYCLING COMBUSTION PRODUCTS ON PRODUCTION OF OXIDES OF NITROGEN, CARBON MONOXIDE AND HYDROCARBONS BY GAS BURNER FLAMES. Preprint, Bureau of Mines, Pittsburgh, Pa., 42p., 1967. 24 refs. (Presented at the Symposium on Air Pollution Control Through Applied Combustion Science, 16th Annual Meeting, American Inst. of Chemical Engineers, New York City, Nov. 26-30, 1967)

Gas appliances designed to lessen the emission of oxides of nitrogen, carbon monoxide, and hydrocarbons, are desired. The formation and decay of oxides of nitrogen and carbon monoxide in the secondary combustion zone of gas-burner flames were investigated as functions of temperature, cooling rate (temperature gradient), and degree of recycling of combustion products into the primary combustion zone of the flame; preliminary measurements were made on hydrocarbons from flames. Recycling, though effective in reducing nitrogen oxides concentrations in effluent from gas appliances, makes the flames longer and less stable. Nitrogen oxides may be reduced by keeping the primary combustion temperature as low as possible, preferably no higher than about 3,000 deg. F., and by starting to cool the combustion gases as soon as possible to about 2,300 deg. F at which temperature concentrations of nitrogen oxides do not increase within the residence time in most gas appliances. Concentrations of carbon monoxide are lowered by recycling of flue gases. The oxidation rate of carbon monoxide is strongly increased by increasing the oxygen concentration. Although the point has yet to be proven by future research, it appears that carbon monoxide concentrations may best be lowered by appliance designs that allow rapid induction of secondary air into the secondary combustion zones. Hydrocarbons can escape from gas burner flames by flowing from the preheat zone of partially lifted flames through the dead space into the surrounding cold atmosphere. Recycling of combustion gases, very low fuel-air ratio, and very high flow rates tend to promote partial lifting of flames from burner ports. It is possible that the emission of hydrocarbons by gas appliances may largely be avoided by designing for well-seated flames on burner ports.

07884L

M. Lew, R. Woodruff, W. Johnson, W. Musa

ION EXCHANGERS IN REMOVAL OF AIR CONTAMINANTS. San
Francisco Bay-Naval Shipyard, Vallejo, Calif., Chemical
Lab.-8024-66, PR-1, ((30))p., March 1967. ((50)) refs.
DDC: AD 808060L

The ability of ion exchangers to be synthesized, modified, regenerated, or used in customary form to react with gaseous air contaminants and effect removal of these contaminants from air was studied. Results show that treated and untreated ion exchangers will react with a variety of gaseous materials and thereby cause removal of these materials from air. Reactions which occur between ion exchange resins and ionized reactants in aqueous media will likely occur in gaseous systems. The possibilities of reactions between exchangers and organic contaminants at nominal temperatures cannot necessarily be foreseen. Favorable reactions between organic vapors and exchanged groups on ion exchange resins are being sought.##

07893

Stern, Arthur C.

AIR POLLUTION CONTROL - PROBLEMS FOR THE AUTOMOTIVE
ENGINEER. Preprint, Public Health Service, Washington, D. C.,
National Center for Air Pollution Control, 15p., ((1967)).
(Presented at the National West Coast Meeting, Society of
Automotive Engineers, Portland, Oreg., Aug. 16, 1967.)

The contribution of the automobile and other gasoline power vehicles to pollution are discussed. The adverse effects and the contributing pollutants are cited. Control efforts are being undertaken under the mandate of the Motor Vehicle Air Pollution Control Act, which authorizes the establishment of standards for the emission of substances harmful to public health. Compliance certification of new motor vehicles and engines and the technical problems involved are discussed. Approaches to vehicular-emission control are discussed, specially the inter-relationship of engine, fuel, and refinery design. The corresponding problems of the automotive engineer are cited.

08075

Griswold, S. S.

REGULATION OF NEW MOTOR VEHICLES. Preprint, Public Health
Service, Washington, D. C., Division of Air Pollution, 7p.,
1966. (Presented at the National Conference on Air Pollution,
Washington, D. C., Dec. 12-14, 1966.)

The problem of air pollution from motor vehicles is discussed. The basis for the discussion is the Motor Vehicle Air Pollution Control Act. It is an amendment to the Clean Air Act of 1963 and was signed by President Johnson on October 20, 1965. It is designed to achieve uniform national control by limiting the emission from all new motor vehicles introduced into commerce, whether manufactured in the United States or imported from abroad. It authorizes the Secretary of Health, Education, and Welfare to establish standards for the emission of any substance which in his judgment is, or may be, injurious to public health or welfare and to require compliance with these standards. At the same time the Act specifies that appropriate consideration be given to technological feasibility and economic costs in prescribing standards applicable to new motor vehicles or engines. Federal emission standards were formally promulgated on March 30, 1966. These standards are applicable to the 1968 model year and reflect those currently in effect in the State of California. To implement these standards, to test for compliance and, generally, to provide the necessary machinery for insuing that the public gets the control it needs, the Abatement Branch of the Division of Air Pollution is establishing a fully equipped laboratory at the Willow Run Airport near Detroit. This laboratory also has the responsibility for evaluating the adequacy of existing standards and the need for more severe standards and less complex test procedures. Field surveys of equipped vehicles in California and elsewhere are also being being conducted. Initial certification of new systems is approved on the basis of performance of test vehicles, but the continued approval for succeeding years will be determined by the systems' effectiveness when evaluated under realistic driving conditions.##

08080

Kukin, I.

UTILIZATION OF ADDITIVES IN CONTROLLED COMBUSTION PRODUCTS. Preprint, Apollo Chemical Corp., Clifton, N. J., 11 p., 1966. (Presented at the MECAR Technical Symposium on Combustion and Air Pollution Control, Oct. 25, 1966.)

Practical applications of chemical additives for reducing air pollution with petroleum fuels are discussed. Successful results have been achieved in the field by the use of additives for fuel oils, both distillate and residual fuels. The major pollutants are: (1) black particulate matter representing primarily unburned hydrocarbons; (2) sulfur oxides (SO2 and SO3). With distillate fuels, where the sulfur content generally is below 0.5%, our primary concern is particulate matter and to a somewhat lesser degree, carbon monoxide, aldehydes and nitrogen oxides. With residual fuels, sulfur, as SO2 and SO3, is the dominant consideration, although the ability to reduce black smoke emission by means of chemical additive is certainly a valuable contribution to air pollution control. The three effective classes of chemical additives are: (1) combustion catalysts, (2) oil-ash slag modifiers, and (3) chemical neutralizing agents. In some cases, these chemical agents can be combined to give one or more benefits. In a recent trial at a power plant, one of our products, SSI-3(P), reduced the black smoke at the same time that it lowered the SO3 content of the flue gas from 90 to 5 parts per million. The case histories cited show how chemical additives are being used to reduce air pollution at the same time that they make their contribution to better overall fuel utilization. AAM##

08156

Karacharov, T. S. and Ye. I. Vorontsova

EFFICIENCY OF MINERAL WOOL FILTERS. In: Survey of U. S. S. R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Sandards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 150-156, May 1960.
CFSTI: TT 60-21475

The efficiency of bitumen treated mineral wool in an arc-welding shop as a dust remover was 80 percent, reaching 90 percent and even higher in isolated cases. After filtering, the air dust content did not exceed 1 mg/cu m in a large majority of cases. Filtering the air through a layer of mineral wool reduced its dust content from 0.21 to 0.018 mg/cu m, which is approximately a removal of 91 percent of the dust. The content of oxides of nitrogen and of carbon monoxide in the recirculated air was below the limit of allowable concentration. The use of mineral wool for the purification of air from arc-welding aerosols proved practical only where the air load per 1 sq m of the filter-layer did not exceed 450 - 600 cu m /hour; a greater load rendered the filter inoperative within a short time. The apparatus should be made up of individual filter cells and the mineral wool overlaid in a wave-like or zigzag manner. In computing the rate of air recirculation the residual dust content should be taken into account. It is suggested that the air supplied to the shop during the cold seasons should be not less than 30 percent of the total unventilated air exchange, which amounts to 700-1,00 cu m/hour per 1 kg of burned electrodes. In these experiments, the dust-retaining capacity of 1 sq m mineral filters averaged 200 g. With an initial air dust concentration of 5 mg/cu m and a rate of air passing of 0.5 m/sec, a filter pad should last 25 hours or three working shifts. Where the initial dust concentration is greater than 5 mg/cu m, the time between filter changes should be shortened accordingly. The use of mineral wool for the purification of recirculating air in arc-welding shops may be more economical than the present fresh air method by 4 to 8 times.

08162

Matsak, V. G.

THE PURIFICATION OF AIR POLLUTED BY VAPORS AND GASES. In: Survey of U. S. S. R. Literature from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, 177-185, May 1960.
CFSTI: TT 60-21475

Methods for the recovery and purification of noxious substances ejected by gas exhaust and ventilating installations are reviewed. It was found easier to purify exhaust gases than ventilating air. The methods include: Chemical purification method, Condensation method, Liquid absorption method, and Absorption by solid absorbents (adsorption). Present methods for air and gas purification can be rendered close to 100 percent free of most acid and alkali gases, organic solvent vapors and some other gases. But no effective and cheap method has been found up to the present for the recovery of carbon monoxide. Purification of air from solvent vapors, such as gasoline, acetone, acetates, etc. can be used effectively only in the case of tail gases and not in the purification of ventilating air, even though it is effective in both instances; the high cost makes its use for purification of ventilation air economically prohibitive. The possibility of using solid absorbents, such as activated charcoal and silicagel for the purification of ventilation air may apply to many cases. The primary obstacle lies in the high cost of adsorbent material and in the consumption of considerable electric energy in overcoming the pressure drop of recuperating installations.

08181

Varlamov, M. L., G. A. Manakin, and Y. I. Starosel'skii

PURIFICATION OF EXHAUST GASES OF A SULFURIC ACID TOWER PLANT BY A FLOWMETER PIPE TYPE OF APPARATUS. Zh. Prikl. Khim., 31(2):178-186, 1958. 19 refs. Translated from Russian by B< S. Levine, U. S. S. R. Literature on Air Pollution and Related Occupational Diseases, Vol. 4, p. 68-77, Aug. 1960. CFSTI: TT 60-21913

A venturi apparatus for the recovery of spray, sulfuric acid aerosol, and nitrogen oxides from the exhaust gases of a sulfuric acid tower plant is described. The experimental arrangement consisted of two units: a small assembly, producing up to 50 cu m/hour, and a larger one producing up to 500 cu m/hour. In one apparatus, the fluid entered the main channel at an angle; in a second apparatus, the fluid entered tangentially and became distributed evenly over the perimeter of the diffuser. A third apparatus had a radial fluid feed in relation to its main axis. The separator walls of the small unit were arranged concentrically which forced the passing gas to impinge upon the surface of the liquid twice in succession. Another type of tube was tested in connection with the large unit. This tube had two radial fluid feeds set at 90 deg, and a separator of the type of abbreviated cyclone TsKTI. The power consumed in the operation of the flowmeter tube type of apparatus in the purification of exhaust gases emitted by the tower nitrose system ranged between 5 - 6 kilowatt-hours per ton of H2SO4, or 10 to 12% of the total power used in the production of one ton of sulfuric acid by the nitrose method.##

08344

Sheppard, Stanton V.

CONTROL OF NOXIOUS GASEOUS EMISSIONS. Proc. MECAR Symp., New Developments in Air Pollution Control, Metropolitan Engineers Council on Air Resources, New York City, p. 21-28, Oct. 23, 1967. 3 refs.

Several new developments have taken place which have helped improve scrubber designs for controlling emission of noxious gases. Some major new technical developments have been: Greater use of the crossflow scrubber design principle, availability of light weight plastic tower packings, and wider acceptance of corrosion resistant glass reinforced polyester plastics. Some noxious gases commonly encountered are oxides of nitrogen, hydrogen chloride, hydrogen fluoride, silicon tetrafluoride, chlorine, chlorine dioxide, sulfur dioxide, hydrogen sulfide and mercaptans. In industrial applications, the removal of noxious gases from exhaust air streams is most often accomplished by bringing the air stream into contact with a liquid stream for a certain period of time. The amount of time required to transfer the noxious gas to the liquid is a function of several factors. These are: Gas rate, liquid rate, solubility of gas, mechanism of contact, and scrubber type. The packed scrubber is used most often today for controlling emission of noxious gases to the atmosphere. It is available in three basic operating designs: Counter current, cocurrent and crossflow. In the counter current packed design, the air stream containing the noxious gases is passed vertically upward in opposite direction to the flow of the down coming scrubbing liquid. The cocurrent packed scrubber allows the air stream and the scrubbing liquid stream to pass through the packed bed in the same direction. In the cross-flow scrubber the air stream moves horizontally through the packed bed while the scrubbing liquid moves vertically downward through the packed bed and perpendicular to the air streams. Three relatively new tower packing shapes are being used more frequently by engineers in designing scrubber equipment for removing gases. These packing materials are constructed of high density polyethylene or polypropylene. This gives them good resistance to corrosion and light weight compared to ceramic ring and saddle packing. Fiber reinforced plastics (commonly designated as FRP) are being used more and more to replace stainless steel, rubber and PVC lined steel and other metallic alloys for scrubber bodies. FRP is a material that uses a combination of polyester or epoxy thermosetting resins and glass fiber reinforcements to give a finished laminate that has excellent corrosion resistance, a high strength to weight ratio, and light weight.##

09340

Newhall, Henry K.

CONTROL OF NITROGEN OXIDES BY EXHAUST RECIRCULATION - A PRELIMINARY THEORETICAL STUDY. Preprint, Society of Automotive Enigneers, 10p., 1967. 15 refs. (Presented at the Mid-Year Meeting of the Society of Automotive Engineers, Chicago, Ill., May 15019, 1967, Paper 670495.)

The control of nitrogen oxides by exhaust recirculation has been evaluated theoretically by digital computer simulation of the engine cycle. Nitric oxide emission, power output, and fuel consumption have been considered. Preliminary results indicate that effectiveness of the recirculation method of nitric oxide control can be accounted for by the attendant shift in the peak temperature chemical equilibrium species distribution. The analysis reveals that nitric oxide reduction is highly dependent on fuel-air ratio, and somewhat less dependent on the temperature of recycled exhaust gases. (Author's abstract)##

09706

Spaite, P. W. and J. H. Ludwig

THE FEDERAL ROLE IN DEVELOPMENT OF METHODS TO CONTROL POLLUTION FROM STATIONARY SOURCES. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 12p., ((1967)).

The Federal Government is currently engaged in a program to develop economical methods to control emissions from atmospheric pollution. The Federally sponsored work includes projects being conducted in government agencies, industry, research institutes, and universities. The combustion pollution control development project has three present goals: large-scale prototype and demonstration studies of processes for control of sulfur oxides from power generation; an intensive search for new sulfur control processes; a program to develop control of sulfur emissions from sources other than combustion of fossil fuels. Future programs will depend on levels of Federal support. Proposals for future programs are: increased support for engineering research and development; assessment of sulfur oxide control processes associated with fossil fuel combustion; long-term work directed toward development of new processes designed to meet projected pollution control requirements beyond 1980; establishment of industrial-oriented studies; and development of equipment.

09773

FAN SCRUBBER HALTS CORROSION ENDING NEED FOR ROOF REPAIRS. Chem. Process., 31(4):67, April 1968.

The manner in which escaping acid fumes were controlled at a particular plant is described. An existing system of water scrubbers was supplanted by a separator based on a centrifugal fan. Flow through the separator is 14,000 cfm of an exhaust containing 750 ppm of nitric acid and nitrogen oxides and 350 ppm of hydrofluoric acid. Most of the fumes are separated by centrifugal force in the fan, into which 6 gpm of water is sprayed. The partially cleaned exhaust then passes through a 48 x 80 x 6 in-thick polypropylene filter which removes nearly all of the remaining wetted fumes. Fumes leaving the separator were reduced to trace amounts. Scrubbing water requirements were reduced by 34 gpm. The complete system was installed at a cost of $8100, less thatn $.70 cfm.

09795

Chatfield, Harry.E. and Ray M. Ingels

GAS ABSORPTION EQUIPMENT. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 210-232, 1967.
GPO: 806-614-30

Gas absorption equipment is designed to provide thorough contact between the gas and liquid solvent in order to permit interphase diffusion of the materials. This contact between gas and liquid can be accomplished by dispersing gas in liquid or vice versa. Absorbers that disperse liquid include packed towers, spray towers and venturi absorbers. Equipment that uses gas dispersion includes plate or tray towers and vessels with sparging equipment. The principles of designing plate towers and packed towers are discussed in detail. The following items are included in the discussion on packed towers: packing materials, liquid dispersion, tower capacity, tower diameter, number of transfer units, height of a transfer unit, and pressure drop through packing. An example of calculations involved in designing a packed tower for the removal of NH3 is illustrated. Liquid flow, plate design and efficiency, flooding, liquid gradient on plate, plate spacing, tower diameter, and the number of theoretical plates are included in the discussion of plate towers with specific emphasis on bubble cap plates. An example of the calculations involved in determining the number of plates required and estimated diameter of a plate tower is illustrated. The choice of gas absorption equipment is usually between a packed tower and a plate tower. Both devices have advantages and disadvantages. Factors which the final selection should be based upon are listed. Spray-type absorbers and venturi absorbers are also briefly discussed. These towers are primarily used for removing particulates from gas streams, though they have some gas absorption applications. The gaseous air contaminants most commonly controlled by absorption include SO2, NH3, NOx, and light hydrocarbons.

10539

May, Hans and Harry Schulz

A NEW DISTRIBUTING INJECTION SYSTEM AND ITS POTENTIAL FOR IMPROVING EXHAUST GAS EMISSION. Society of Automotive Engineers, Preprint, 10p., 1968. 24 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1968, Paper 680043.)

The control principles and the design of a fuel injection system are described. In this system, injection time and injection pressure are controlled independent of each other. The injection time is controlled by two rotating discs having slots, which are turnable to each other and which are turned by the influence of a centrifugal governor in connection with a three-dimensional cam. With the three-dimensional cam, a punctiform scanning of engine characteristics can be realized. Some results obtained with this injection system are shown for example, fuel quantity characteristic, CO and n-hexane characteristic of a 4-cyl 4-stroke engine, injection pressure distribution dependent on crank angle, and consumption loops for injection and carburetor operation. (Authors' abstract, modified)##

11234

K. C. Tessier, and H. E. Bachman

FUEL ADDITIVES FOR THE SUPPRESSION OF DIESEL EXHAUST ODOR AND SMOKE. PART I: PROPOSED MECHANISM FOR SMOKE SUPPRESSION.

Preprint, American Society of Mechanical Engineers, New York, 8p., 1968. 28 refs. (Presented at the ASME Winter Annual Meeting and Energy Systems Exposition, New York, N. Y., Dec. 1-5, 1968, Paper 68-WA/DGP-4.)

A combination of odor mask and barium containing additive in diesel fuel is effective in reducing smoke, odor and irritation from diesel exhaust. It has shown no injurious effects on fuel systems, exhaust systems or engines. This paper discusses the engine evaluation of these additives in American diesel engines. The major implications of using barium additives in the fuel are discussed as well as possible mechanisms for their action. Of special interest is a description of the results of using the Ricardo, high speed cine technique to visually study the combustion of additive treated fuel. This technique shows in a spectacular way that smoke clearing occurs principally in the combustion chamber. (Authors' abstract, modified)##

11912

S. Ruschenburg

EXHAUST GAS MEASUREMENTS DURING A SIMULATED TRAFFIC JAM IN A ROAD TUNNEL. ((Abgasmessungen bei simuliertem Verkehrsstau in einem Strassenverkehrstunnel.)) Text in German. Stadtehygiene, 19(6):109-113, June 1968.

Prior to the opening of the Klostervall-Glockengresserwall Tunnel, the Hamburg Construction Office for Bridge Construction and Engineering, utilizing 20 diesel trucks and 40 gasoline-powered automobiles (Volkswagens), tested the efficiency of the tunnel's built-in mechanical ventilators and studied the problem of diminished visibility from diesel exhausts. Schematic drawings of the 55m tunnel with locations of measuring, regulation, and warning instruments are presented. A study was made of the carbon monoxide (CO), nitrous gases, and benzene hydrocarbons in the tunnel atmosphere while the vehicles, standing bumper to bumper, idled for 20 minutes to stimulate the worst possible traffic conditions. Following an initial increase during startup, the CO concentration decreased slightly and thereafter increased to 20 ppm with the diesel trucks after 50 minutes. CO increased to 330 ppm after 25 minutes and 380 ppm after 50 minutes with the gasoline-powered automobiles. Neither the lower explosive limit nor the maximum allowable hygienic concentration was reached for the benzene hydrocarbons. No evidence of any danger from visibility impairment was found. Measurements made at the various measuring stations showed uniform distribution of CO in the tunnel although none of the air turbulence which would have been created by moving traffic was present. The ventilators were able to move the air column towards the tunnel exit. The study shows that continuous surveillance of tunnel air for CO is needed and that automatic installations for measuring and regulating CO and for warning against it are preferred to manual operations.##

12040

Frankel, R. J.

PROBLEMS OF MEETING MULTIPLE AIR QUALITY OBJECTIVES FOR COAL-FIRED UTILITY BOILERS. J. Air Pollution Control

Assoc., 19(1):18-23, Jan. 1969. 16 ref.

Gaseous wastes and particulate emissions are produced in the process of burning coal to produce electrical energy. In attempting to control these gaseous wastes, changes in the operation efficiency of boilers and secondary equipment are likely to result, and in addition liquid and solid waste streams are produced. The interrelationships among the various forms of wastes and the effects of air quality control on process efficiency are often overlooked in studies of environmental quality management. The study was undertaken to evaluate the technical alternatives for handling gaseous and particulate emissions from coal-fired boilers and to determine the feasibility of meeting several standards simultaneously. The gaseous emissions of major importance in the combustion of coal are particulates, sulfur oxides and nitrogen oxides. Particulates can be controlled by a trade off among further preparation at the mine (for additional ash removal), type of boiler, use of dust control equipment and high stacks for for dispersion of residual emissions, if ambient air standards are considered. Sulfur oxides reduction depends currently on fuel substitution, limestone additives in the boiler and some form of contact process such as wet scrubbing, or the use of high stacks. Nitrogen oxides control in coal fired boilers is restricted to small reductions by either changes in boiler operation, such as lower excess air levels, adsorption during wet scrubbing or by dispersion from high stacks. (Author's Abstract)##

12090

NEW OIL ADDITIVES CONTROL AIR POLLUTION. Chem. In Can., 20(11):9, Nov. 1968.

Two new products, one a paint, the other an oil additive, are proving to be effective in control of air pollution. The first is a water base paint to prevent low temperature corrosion in commercial hot water or low pressure fire tube boilers. It must be applied every 1 to 4 weeks and protects completely against H2SO4 corrosion. The second formulation is a multipurpose oil additive for industrial and power utility boilers where fire side surfaces are not readily accessible. The results show it to be particularly effective in alleviating high temperature slagging and corrosion, preventing corrosion and fouling of cold end boiler surfaces, and reducing emissions of NOx, SO3, and acid soot to the atmosphere.##

12958

Sarto, Jorma O. and Paul G. Fouts

ENGINE EXHAUST RECIRCULATION. (Chrysler Corp., Highland Park, Mich.) U. S. Pat. 3,444,846. 6p., May 20, 1969. 6 refs. (Appl. Apr. 24, 1967, 8 claims).

A device is described for the recycling of exhaust gases in an internal combustion engine. The formation of nitrogen oxides does not become particularly objectionable until the combustion temperature exceeds about 2200 F, but the usual engine combustion temperature, which increases with engine load or the rate of acceleration at any given speed, frequently rises to about 2500 F. It is known that the recycling of at least 5% and not more than 25% of the total exhaust gases through the engine will reduce the combustion temperature to less than 2200 F. The desired result is usually obtained with the ordinary engine upon the recycling of about 15% of the total exhaust gases. The invention comprises a bypass duct connecting the exhaust and inlet headers having its opposite ends in communication with the exhaust header adjacent the hot spot and with inlet header downstream of the throttle valve, the bypass duct also having a fixed restriction dimensioned so that more than 5% but less than 25% and usually about 15% of the total exhaust gases are conducted through the bypass duct when the pressure differential between the ends corresponds to cruising or part open throttle acceleration conditions.

12978

Pabson, S. R.

VERMICULITE IN THE ABSORPTION OF GASES, VAPOURS AND FUMES.
Ind. Chemist, vol. 37:219-220, May 1961.

A method for the absorption of gases in low concentration is presented. Exfoliated vermiculite is placed in horizontal beds containing 0.12 to 0.38 in. granules in a thickness of 2 ft. The vermiculite is impregnated with a liquid reagent selected according to the requirements of the gas to be absorbed. The air containing the gases to be absorbed flows downwards through the bed at 50 cu ft/m/sq ft surface giving a resistance of 2 in. wg. This corresponds to a space velocity of 1500 cu ft of gas/hr/cu ft of material. The bed remains effective for long periods depending on the reagent used and the type of gas absorbed, can be regenerated an indefinite number of times. The process has been found particularly effective for the absorption of gaseous constituents in very low concentration which are otherwise not easily absorbed in liquid solutions. Some gas mixtures successfully absorbed by this method are diesel fumes, NOX, SOX, and odors.

13014

Goller, Edward S.

CARURETOR CONTROL MEANS FOR INTERNAL COMBUSTION ENGINE.
(Assignee not given.) U.S. Pat. 3,446,194. 4p., May 27, 1969.
1 ref. (Appl. June 21, 1967, 8 claims).

Automobiles conventionally employ a butterfly valve in a carburetor to control flow of fuel to the automobile's engine. Upon deceleration, this butterfly valve is suddenly closed resulting in raw fuel being sucked into the engine. This raw fuel is not burned properly resulting in increased air pollution during deceleration. An invention is presented to provide means for automatically holding the butterfly valve open for a few seconds after deceleration is initiated to admit air into the carburetor downstream of the butterfly valve for forming a combustible mixture with the raw fuel hanging on the walls of the carburetor and intake manifold. The set screw which adjusts the idling

speed of the engine is replaced by a solenoid having its armature normally extended to give the engine a faster-than-normal idle. The armature is automatically withdrawn to give the engine a normal idle 3 to 10 sec after deceleration has begun. This allows for combustion of the raw fuel which collected in the engine when the butterfly valve closed.

13033

Griffing, Margaret E., Frances W. Lamb, and Ruth E. Stephens

METHOD OF CONTROLLING EXHAUST EMISSION. (Ethyl Corp., New York, N.Y.) U.S. Pat. 3,449,063. 4p., June 10, 1969. 5 refs. (Appl. May 13, 1966, 10 claims).

A method is presented for reducing unburned hydrocarbons, carbon monoxide, and nitrogen oxides of the exhaust gas from internal combustion engines operating at an air/fuel ratio of 15 by contacting the exhaust gases with oxygen, ammonia, and a catalyst. Additional oxygen is first injected into the exhaust stream. Ammoniam carbonate is added and vaporized to ammonia by the heat of the exhaust gases. The ammonia, oxygen, and exhaust gases are then contacted with the catalyst at a temperature between 600 and 800 F. The catalyst consists of an alumina support impregnated with 0.001 to 25 wt % copper oxide and with 0.001 to 3 wt % palladium.

13160

Kita, Nobuyuki and Yoshiya Fuse

EXPERIMENTS TO INHIBIT NITROGEN OXIDES DEVELOPED WITHIN THE EXHAUST SYSTEM OF DIESEL ENGINES. (Diesel haiki gasu chu no chisso sankabutsu no hassei yokusei ni tsuite no 2, 3 no jikken). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan), 48(504):241-249, April 1969. 10 refs.

Nitrogen oxides are the main components of harmful gases which develop within the exhaust system of diesel engines. Experiments were performed using a one-cylinder Fulperland F-2 diesel engine (compression ratio of 22, 3 horsepower, 1500 rpm). Nitrogen monoxide and dioxide were measured by Salzmann's method. Concentration of nitrogen oxides ranged from 180 to 550 ppm; the more the load on engine, including the number of rotati rotations, the more was the concentration of nitrogen oxides with the maximum concentration of 1200 rpm. The ratio of nitrogen dioxide to nitrogen oxides decreased with the increased load on the engine, and was not influenced by the number of rotations. The development of nitrogen oxides was effectively inhibited by sending the exhaust gas partially back to the pre-engine combustion chamber. Nitrogen oxides were slightly inhibited by increasing negative pressure within the engine chamber. However, engine power was decreased by this procedure. By delaying the fuel injection time, formation of nitrogen oxides was slightly inhibited without decreasing the engine power. To confirm these results, these experiments should be repeated using a larger diesel engine.

13198

Jefferis, George C. and J. D. Sensenbaugh

EFFECT OF OPERATING VARIABLES ON THE STACK EMISSION FROM A MODERN POWER STATION BOILER. Preprint, Am. Soc. Mech. Engrs., Paper 59-A-308, 8p., 1959. 9 refs. (Presented at the Annual Meeting of the Am. Soc. Mech. Engrs., Atlantic City, N. J., Nov. 29-Dec. 4, 1959.)

A series of tests on stack emission from an oil-fired boiler are described. The effects of windbox air admittance, oil temperature, burner tilt, excess air, and gas recirculation on the dust loading, the combustible content of the dust, and the concentration of nitrogen oxides were studied. In the first series of tests, closing the main air dampers slightly and opening the auxiliary dampers quickly produced large increases in dust loading and combustible content. When a wider range of damper settings was used, the dust-loading curve did not rise as sharply, and the combustible content was constant over the entire range of damper settings. The NO concentration decreased as the main air dampers were closed and the auxiliary ones opened. Increasing the oil temperature by 35 F halved the dust emission and reduced the combustible portion by 15 to 17%. The nitrogen oxides showed a decreasing tendency with increasing oil temperature. With excess air, the dust was reduced by 20%, and the combustible content by 17%. However, increasing the oxygen percentage increased the nitrogen oxides from 184 to 258 ppm. Burner tilt and gas recirculation appeared to be interrelated, since the dust loading increased with increasing gas recirculation at zero tilt. Other tests at positive tilts with varying gas recirculation gave a constant dust loading. The combustible content was little affected by the quantity of recirculated gas, and the nitrogen oxides concentration decreased with increasing gas recirculation.

13202

Schmitt, Karl, Wilhelm Ester, Hans Heumann, and Harry Pauling

NITROGEN OXIDE CONVERSION. (Hibernia Chemie GmbH, Gelsenkirchen-Buer, Germany, and Harry Pauling, Munich, Germany) U. S. Pat. 3,453,071. 7p., July 1, 1969. 4 refs. (Appl. May 16, 1966, 29 claims).

In the production of nitric acid and other nitrogenous products, exhaust gas is produced which contains significant quantities of nitrogen oxides, particularly NO and NO_2. A process for absorbing these oxides and recovering them as ammonium nitrite includes adjusting the mole ratio of NO to NO_2 to 1 and then introducing the adjusted gas into an ammoniacal solution of ammonium nitrate. The ammonium nitrate content of the absorbent solution is controlled so that the solution viscosity at any given temperature is higher than the viscosity of water at the same temperature. When the ammonium nitrate concentration is maintained at about 40 to 50 weight percent and the absorption process is operated at 20 to 30 C, at least half the ammonium nitrite formation takes place at the liquid-vapor interface. The remainder of the ammonium nitrite is produced in the gas phase by successive absorption of small amounts of gaseous ammonia in the vapor space, where it is neutralized with water vapor and nitrogen oxide to form ammonium nitrates as well as the ammonium nitrites. These dissolve in the absorbent solution. By preventing the development of easily decomposable ammonium nitrite mists, the process minimizes efficiency losses and explosion dangers.

13205

Markvart, Miroslav and Vladimir Pour

SELECTIVE REDUCTION OF NITROGEN OXIDES WITH AMMONIA. (Selektivni redukce kyslicniku dusiku amoniakem). Text in Czech. Chem. Prumysl (Prague), 19(1):8-12, 1969. 12 refs.

In manufacturing nitrogen acids, catalytic reduction of nitrogen oxides in fall gases is the most effective method of neutralization. Using ammonia as a catalyst, nitrogen oxides can be selectively eliminated. The consumption of fuel using ammonia is approximately ten times lower than with other reducers. Tests were conducted to gain more information about the method. All measurements were taken under atmospheric pressure, and the reaction took place in the kinetic range. Nitrogen oxides were detected by the standard titrimetric method. Catalyzers were prepared by depositing active metal on aluminium. In the absence of oxygen, the reduction is fastest on platinum catalyzers; 95% conversion is reached with temperatures above C. In the presence of oxygen on the same catalyzer, the temperature may be as low as 180 C. The increase in speed of reaction is most evident with small concentrations. The activity of the catalyzer is greatest when the amount of Pt is 1%. In all of the tests, the greater the speed of the gases, the higher the temperature must be. The only disadvantage of this method is that ammonia salts are generated that may deposit on the cool parts of the reactor.

13258

Hollander, Egon

REDUCTION OF NITROGENOUS GASES BY CHARCOAL. (Redukcia nitroznych plynov drevenym uhlim). Text in Czech. Chem. Prumysl, 15(8): 498-500, 1965. 9 refs.

Modern methods of reducing nitrogen oxides from emissions of industrial plants use catalytic reduction of nitrogen oxides with combustible gases. In the experiments reported, complete catalyst-free reduction of nitrogen oxides to elementary nitrogen was accomplished by the use of charcoal. The gases were fed to a quartz reduction tower filled with preheated granular charcoal followed by washing with an indicator solution of alpha-naphthylamine, sulfanilic acid, and sodium acetate; drying with calcium chloride, a flow meter, and a dry air pump. Judged by the high sensitivity of the indicator, the efficiency of the process can be considered 100%. The remaining ash has a porous structure which does offer noticeable resistance to the gas passing through it. At gas speeds of 0.08 or 0.15 m/sec the consumption of charcoal is 40 kg/1000 cu m of incoming gas. The upper limit of speed for a grain of 3 to 4 mm is 0.29 m/sec. At higher speeds the consumption of charcoal doubles. The method is applicable to any industrial process in which nitrogen oxide concentration is less than 50 mg/L of waste gases. The possibilities exist of adapting it to batch processes and of utilizing the generated heat of reaction. A minimum of equipment is required, and water is not produced as a by-product.

13394

Austin, H. C. and W. L. Chadwick

CONTROL OF AIR POLLUTION FROM OIL-BURNING POWER PLANTS. Mech. Eng., 82(4):63-66, April 1960. 2 refs.

California law requires that stack-plume opacity not reach or exceed Ringelmann No. 2 shade for more than 3 min in any hr. To comply with this law, the Southern California Edison Company examined their industrial plumes. Gas emissions were measured for particulates, SO2, SO3, and NO. Plume opacity was found to be significantly affected by the amount and size of particulates, the amount of SO3 present, and the amount of water vapor present. Particulate removal was found to be most efficient with the use of an electrostatic precipitator which removes about 90% of the particulate matter. The most effective removal of SO3, SO2, and NO, 75-90%, could be accomplished by the use of a vanadium catalyst at high temperature, followed by introduction of ozone and electrostatic precipitation. This process proves to be economically unfeasible, however. It was found that NO formation is best limited by delaying the complete combustion in the boiler and protracting the flame path.

13403

Ganz, S. N., I. Y. Kuznetsov, V. A. Shlifer, and L. I. Leykin

REMOVAL OF NITROGEN OXIDES, SULFUR DIOXIDE, AND SULFURIC ACID MIST AND SPRAY FROM INDUSTRIAL EXHAUST GASES USING ALKALINE PEAT SORBENTS. (Ochistka vykhlopnykh gazov ot okislov azota, sernistogo gaza, tumana i bryzg sernoy kisloty torfoshchelochynymi sorbetami v zavodskikh usloviyakh.) Text in Russian. Zh. Prikl. Khim., 41(4):720-725, 1968. 1 ref.

Studies on the purification of exhaust gases from the Mills-Packard process under industrial conditions revealed that the most effective additive to the peat sorbents was ammonia, the sorption of gases producing a useful organomineral fertilizer. Addition of the ammonia directly to the boiling layer of sorbent was the most efficient method, and three sorbent layers were used. Successive layer thicknesses were 200-300, 300-400, and 400-450 mm with moisture content 35-40, 40-45, and 45-55 percent, respectively. Raw material requirements for sanitary purification of 60,000 cu m/hr are (in tons per hr): 0.294 ammonia, 1.5 dry peat, and 3 peat with 50 percent moisture. The ton-per-hour trapping rate was: 0.318 nitrogen oxides, 0.405 sulfur dioxide, and 0.012 sulfuric acid. Data are given for the effectiveness of the resultant fertilizer determined from agricultural study.

13458

Pawlikowski, Stefan, Stanislaw Aniol, and Stanislaw Bistron

EXPERIMENTS ON THE ABSORPTION BY AMMONIA OF NITROGEN OXIDES THROUGH THE USE OF NOZZLE SYSTEMS, ON A PILOT-PLANT SCALE. II. ABSORPTION BY SOLUTIONS CONTAINING AMMONIUM CARBONATE AND BICARBONATE. (Proby amoniakalnej absorpcji tlenkow azotu w ukladach dyszowych w skali poltechnicznej. II. Absorpcja roztworem zawierajacym weglan i wodoroweglan amonowy.) Text in Polish. Przemysl. Chem., 43(2):80-83, 1964. 1 ref.

Best results with respect to nitrogen oxide absorption by systems containing ammonium carbonate and bicarbonate are obtained when the $NH_3:CO_2$ ratio is set as low as possible. This results in thermal reactions which raise the temperature by only insignificant amounts, thus reducing the loss of ammonia by volatilization to 2 - 5% of bound nitrogen, vs approximately 30% by conventional absorption methods. The experimental plant, approximately one-tenth the size of a commercial installation, operated at high efficiency/ 90-99% in terms of nitrogen absorption and 70% in terms of total absorption. The yield was unaffected by changes in operating parameters over a wide range. The process is safe, even when the reactor product becomes acid.

13535

Straschill, Max

THE REPROCESSING OF NITROGEN OXIDE-CONTAINING WASTE GASES IN PICKLING PLANTS. (Die Aufarbeitung nitrosehaltiger Abgase in Beizereien.) Text in German. Metall-Reinigung Vorbehandlung, 12(11):210-211, Nov. 1963. 3 refs.

The most practical method for detoxification of the nitrogen oxides that are present in pickling plant waste gases is through absorption and decomposition in aqueous solutions of alkalies, urea, aminosulfonic acid or ammonia. Of these, the ammonia process, in which a mixture of the waste gases and ammonia is passed through an activated charcoal filter, possesses the advantage that the reaction which takes place at the filter yields stable ammonium salts. These do not attack the activated charcoal, and may be removed by scrubbing, thus restoring the efficiency of the filter. Other procedures, such as adsorption of the nitrogen oxides on activated charcoal, activated alumina, and activated silica are effective but rather expensive.

13537

Ermenc, E. D.

WISCONSIN PROCESS SYSTEM FOR RECOVERY OF DILUTE OXIDES OF NITROGEN. Chem. Eng. Progr., 52(11):488-492, November 1956. 10 refs.

The Wisconsin Process was proven technically feasible as a means of producing HNO_3. The recovery system operated in accordance with design, except for minor modifications made in the field. Total cost of the nominal 40 tpd equivalent 100% HNO_3 plant, including engineering and overhead, was slightly over $2,000,000, with about 60% of the cost in the recovery system. The bulk of the operating costs also occurred in the recovery system. Since the system is not quite economical enough for the production of a cheap chemical like HNO3 in the U. S., it may have eventual use in the production of N2O4 or recovery of dilute nitrogen oxides for pollution prevention. There may still be areas in the world where the Wisconsin Process may be economic, particularly where ammonia is expensive or not available.

13538

Childers, Eugene, Charles W. Ellis, and Donald J. Ryan

METHOD OF REMOVING NITROGEN OXIDES FROM GASES. (Du Pont De Nemours (E.I.) and Co., Wilmington, Del.), U. S. Pat. 3,125,408, March 17, 1964. 6 refs. (Appl. Dec. 19, 1955, 1 claim).

A process for the disposal of stack gases containing nitrogen oxide fumes is presented. The waste gas is first mixed with an excess amount of a reducing gas containing 60-90% of an alkane. The mixture is passed over a platinum catalyst supported on activated alumina at a reaction temperature between 450 and 1000 C, and a space velocity between 25,000 and 150,000 reciprocal hr/cu ft of catalyst. The nitrogen oxide fumes are reacted with the reducing gas to form nitrogen, water, and carbon dioxide which can be discharged to the atmosphere.

13554

Cohn, Johann G. E.

METHOD OF REMOVING NITROGEN OXIDES FROM GASES. (Engelhard Industries, Inc., Newark, N. J.) U. S. Pat. 3,118,727. 4p., Jan. 21, 1964. 9 refs. (Appl. Oct. 12, 1956, 11 claims).

A process is described for recovering heating values and purifying waste gases produced by the oxidation of ammonia in the production of nitric acid. Waste gases are mixed with a hydrocarbon fuel and the mixture is passed over a 0.1 to 5.0% by weight rhodium and/or palladium supported catalyst at the reaction temperature of 700-725 F. The heat generated in passing the mixture over the catalyst may be used to raise the gas temperature or to generate steam isothermally. Space velocity for the reaction may be in the range of 60,000-110,000 standard vols of gas/vol of catalyst/hr. The more hydrocarbon fuel used, the more complete is the removal of nitrogen oxides.

13662

Ganz, S. N., A. I. Luk'yanitsa and L. A. Bel'china

COMBINED PRODUCTION OF IRON-NITROGEN FERTILIZERS AND PURIFICATION OF GASES FROM NITROGEN OXIDES. (Kombinirovaniye proizvodstva azotnozhelezistykh udobreniy s ochistkoy gaza ot okislov azota). Text in Russian. Zh. Prikl. Khim., 37(1):1609-1611, 1964. 2 refs.

Waste pickling solution from metal-working factories with an approximate content of 25% FeSO4 and 4-5% free H2SO4 can be used for purification of waste gases containing oxides of nitrogen. An unstable complex (Fe(NO)SO4) is formed when the gases are passed through the pickling solution, which on heating breaks down to give FeSO4 and pure NO, which can then be used to form HNO3. Treatment of the ferrous sulfate with ammonia and water gives a mixture of iron hydroxides and ammonium sulfate which can be used as fertilizer. In this paper, rates of absorption of NO and NO plus NO2 by solutions of FeSO4 were studied at various conditions and concentrations of NO and NO plus NO2.

13689

Atroshchenko, V. I., A. N. Tseytlin, A. P. Zasorin, and V. S. Zolotarev

UTILIZATION OF NITROGEN OXIDES - BY-PRODUCTS OF CERTAIN INDUSTRIES. (Utilizatsiya okislov azota - otkhodov nekotorykh proizvodstv). Text in Russian. Khim. Prom. (Moscow), 1(1):79-80, 1960.

Production of nitric acid from exhaust gas with high NO content as compared with exhaust gas with low NO content plus NO2 is discussed. A method is described which involves cooling the gases to 25-30 C, introducing additional air, and carrying out oxidation in a cooler-oxidizer. About 8% absorption is achieved with 35% nitric acid absorbent. Specifications for an operating installation which produces 2500 kg of 55% acid are given. A modified version using oxygen rather than air is mentioned.

13707

Bylov, V. D., Yu. D. Znamenskiy, L. P. Kapitonova, and M. S. Shchedrov

ON THE SULFURIC ACID METHOD OF COLLECTING NITROGEN OXIDES FROM INCOMPLETELY OXIDIZED GASES. (K voprosy o sernokislotnom metode ulavlivaniya okislov azota iz nedookislennykh gazov). Text in Russian. Zh. Prikl. Khim., vol. 35:1503-1505, 1962. 3 refs.

Incompletely oxidized gases were oxidized with a solution of HNO3 in 93% sulfuric acid in a one-tray bubbling column to study aspects of sulfuric acid collection of nitrogen oxides. Maximum removal (79%) was achieved with a 5% HNO3 concentration and an input NO plus NO2 concentration of 0.573 volume percent. It is concluded that effective sulfuric acid removal of nitrogen oxides with 93% sulfuric acid can be accomplished after preliminary oxidation with a 3-4% solution of HNO3 in 93% H2SO4 when the oxidation and absorption cycles are carried out separately in the liquid phase.

13718

Trofimov, A. I.

REMOVAL OF NITROGEN OXIDES FROM COKE OVEN GAS. (Ochistka koksovogo gaza ot okislov azota). Text in Russian. Koks i Khim., no. 2:42-43, 1966.

An arrangement for removal of nitrogen oxides from coke gases, installed at the Yasinovskiy Coal-Tar Chemical Plant, is described. It converts NO to NO2 (in 110-120 sec at 70-80 C and 15-16 bar), which in turn reacts with olefins to form a resin which, after cooling to 30-40 C, is washed in a scrubber filled with residue from 50 x 50 mm Raschig rings. The installation was designed for operating with a 0.8% oxygen content in the coke gas, but 0.4-0.5% oxygen is found sufficient, precluding the need for introducing air. Operational reduction of nitrogen oxides is from 12-18 to 2-3 cc/cu m. This arrangement was installed at a cost of 234,000 rubles.

13741

Ganz, S. N., R. I. Braginskaya, N. I. Gogodetskiy, and M. A. Lokshin

ABSORPTION OF NITROGEN OXIDES WITH MILK OF LIME IN MECHANICAL ABSORBERS OF PILOT INSTALLATIONS. (Absorbtsiya okislov azota izvestkovym molokom v mekhanicheskikh absorberakh opytno-promyshlennoy ustanovki). Text in Russian. Izv. Vysshikh Uchebn. Zavedenii Khim. i Khim. Tekhnol., 5(1):155-159, 1962. 4 refs.

Pilot operation of a 16 cu m-capacity absorber for absorbing nitrogen oxide with milk of lime was carried out for six months. Physicochemical and hydrodynamic factors were studied to establish the dependence of degree and rate of absorption of nitrogen oxides by Ca(OH)2 solution on concentration of nitrogen oxides in the gas, and the dependence of the concentration of nitrite-nitrate salts and CaO in the solution on volumetric gas flow rate and quantity of liquid in the apparatus. Experiments were made at 45-50 C and 55-60 C. Estimates indicate this method will give a ten-fold reduction in the cost of HNO3 production, with an annual amortization cost of 10,500 rubles as compared with 165,600 rubles for existing methods.

13746

Daniels, Farrington, William G. Hendrickson, and Elton Gordon Foster

NITRIC OXIDE RECOVERY SYSTEM. (Wisconsin Alumni Research Foundation, Madison). U. S. Pat. 2,578,674. 14p., Dec. 18, 1951. 13 refs. (Appl. Mar. 28, 1949, 18 claims).

A process for the recovery of nitrogen oxides from gaseous mixtures is presented. The nitrogen oxide-containing gas is first cooled and then dried by passing it through a body, shower, stream, layer, or bed of solid adsorbent having a preferential adsorbability toward water, and the dried gas is then contacted with a catalyst mass having the function of accelerating oxidation of the nitric oxide content of the gas mixture to nitrogen dioxide. The dry gas mixture is contacted with particles of a solid adsorbent, such as silica gel, which separates nitrogen dioxide from the other components of the gas mixture. Adsorbed nitrogen dioxide is de-sorbed by circulating hot nitrogen dioxide through and in direct contact with the solid adsorbent material. The remaining adsorbed NO2 is flushed out by means of hot dry air contacted with the solid adsorbent. When NO2 is to be converted to HNO3, oxygen-containing air is used, and when the NO2 is to be liquified, hot dry CO2 or nitrogen can be used.

13550

Bent, Franklin A.

PROCESS FOR THE REMOVAL OF NITRIC OXIDE FROM GASES. (Shell Development Co., San Francisco, Calif.) U.S. Pat. 1,888,547, 3p., Nov. 22, 1932. (Appl. May 14, 1931, 20 claims).

A process for removing nitrogen oxides, particularly nitric oxide, from waste gases comprises reduction of the gas with a chromous compound. The products of the reaction are probably hydroxlamine or ammonia, depending on the conditions of the reaction. Chromous salts of organic or inorganic acids may be used, and the reaction should take place at room temperature as high temperatures decrease the amount of nitric oxide taken up by the chromous salt solution. Neutral chromous compounds which are water soluble give the best results. Under certain conditions, it may be advantageous to use chromous compounds in the solid state with or without a support.

13828

Stephan, David G.

RECENT AIR POLLUTION CONTROL DEVELOPMENTS: A REVIEW OF PUBLISHED INFORMATION. Chem. Eng. Progr. Symp. Ser., 57(35):39-50, 1961. 336 refs.

In this review and bibliography of 336 articles on air pollution control published from August 1958 through July 1960, most of the articles are within five categories: research reports, descriptions of specific control installations, discussion of controls for a particular industry or a given process, discussions of a class of control device or techniques, or descriptions of control equipment. The remaining papers are general discussions of pollution problems or control devices. Those articles describing research results and those of a general nature are reviewed. These and the remaining references are included in a subject index keyed to a complete bibliography. This presentation is designed to provide chemical engineers with a guide to recent developments and to assist them in solving their own pollution problems.

13893

Anderson, H. C., P. L. Romeo, and W. J. Green

A NEW FAMILY OF CATALYSTS FOR NITRIC ACID TAIL GASES. Nitrogen, no. 50:33-36, Nov./Dec. 1967. 6 refs.

A unitary ceramic cartridge was designed to act as a precious metal catalyst support. The support consists of a block of ceramic, through which a multitude of small parallel channels pass which are coated with the precious metal. Bench-scale and field experience have shown that the unitary catalyst is well-adapted to the treatment of nitric acid stack gases. Using natural gas as a fuel, decolorization of stack gases is effected using palladium as the catalyst on the ceramic support. The ceramic structure is well designed for the two-stage catalytic removal of NO and NO2 in gases containing more than the 3% maximum oxygen level required for one stage removal. By applying platinum-alumina on the ceramic cartridge, excellent abatement (94%) of the nitrogen oxides present in the gases is achieved at 100 psi and space velocities up to 150,000.

13899

Varlamov, M. L., G. A. Manakin, Ya. I. Starosel'skiy, and L. S. Zbrozhek

INVESTIGATION OF THE AMMONIA METHOD OF REMOVING NITROGEN OXIDES FROM THE EXHAUST GASES OF A NITROGEN-OXIDE NITRIC-ACID TOWER SYSTEM. I. (Issledovaniye ammiachnogo metoda ochistki ot okislov azota otkhodyashchikh gazov bashennoy nitroznoy sernokislotnoy sistemy). Text in Russian. Nauchn. Zap. Odessk. Politekhn. Inst., vol. 40:24-33, 1962. 4 refs.

Data from laboratory study of the removal of low concentrations of nitrogen oxides using gaseous ammonia and ammonia water are presented. The use of gaseous ammonia, in conjunction with acoustic coagulation with an aerosol, yielded an average degree of removal of 85% when incoming gases were highly oxidized. Nitrogen dioxide, and an equimolecular mixture of NO and NO2, reacted with 82-93% completeness with gaseous ammonia, this value increasing slightly with increased reaction volume. A gas lift using ammonia water yielded 63.6% purification with a 40% content of nitrogen oxides. The degree of oxidation of industrial exhaust gases is an important factor determining the degree of purification by this method. The data given correspond to an equimolecular NO and NO2 mixture.

13958

Agnew, W. G.

FUTURE EMISSION-CONTROLLED SPARK-IGNITION ENGINES AND THEIR FUELS. Proc. Am. Petrol. Inst. Sect. III, vol. 49:242-280, 1969. 26 refs.

Future trends in vehicle and gasoline design for the purpose of meeting increasingly stringent air pollution controls are discussed. Federal exhaust emission standards for 1970 are more stringent than those for 1969. Standards now require 10% lower hydrocarbon and CO emissions and measurement methods have been changed from a concentration basis to a calculated mass basis. Emission control systems are improved and are integral with the power plant and the fuel system. Included in future plans are evaporative emission restrictions, nitrogen oxides emission control, and more stringent hydrocarbon and CO emission controls. New devices available for control include large manifold air injection reactors, catalytic converters, and alternate power plants such as gas turbines, external combustion engines, and electric propulsion. Attention will be given to reducing the extreme deviations of high volatility gasolines in the summer and low volatility gasolines in the winter and reducing eye irritation by reducing the amount of aromatic hydrocarbons in the engine exhaust gas. Propane may be used since it permits leaner mixtures. While emission standards are met, companies will try to maintain or improve present levels of driveability, reliability, fuel economy, cost, and owner convenience. At the same time, the oil industry will be making necessary changes to ensure that the new hardware systems will operate with the greatest possible satisfaction to the car owner.

13987

Abthoff, J. and H. Luther

THE MEASUREMENT OF OXIDE OF NITROGEN EMISSION FROM DIESEL ENGINES AND ITS CONTROL BY MODES OF ENGINE OPERATION. (Die Messung der Stickoxid-Emission von Dieselmotoren und ihre Beeinflussung durch Massnahmen am Motor). Text in German. ATZ (Automobiltechnische Zeitschrift) (Stuttgart), 71(4):124-130, 1969. 14 refs.

Endeavoring to lower the carbon monoxide and nitrogen oxide emissions by diesel engines, the authors carried out an extensive series of measurements on three water-cooled four-cylinder and three air-cooled single-cylinder diesel engines, three of which had direct fuel injection, two were equipped with a mixing chamber, and one worked by the 'M' method. The standard equipment of an internal combustion engine performance-test stand was augmented by apparatus for exhaust gas analysis. During engine operation, samples of exhaust gas were removed through a tap from the exhaust pipe, cooled, dried, and conveyed through a branched pipe to three measuring stations. One part of the sample was analyzed in a flame ionization detector, another was used for determination of the CO and CO2 contents by recording infrared absorption analyzers, and the third part was first oxidized and then admitted to a photometer for determination of its total NO2 content. In the oxidizer, developed by the authors for speedy intermittent oxidation of NO to NO2, successive exhaust gas samples are pumped alternately into one of two oxidation chambers. The exhaust gas is pressurized, oxidized by compressed oxygen, and released through a pressure-reducing valve into the NO2 photometer. In addition, the possibilities of lowering nitrogen oxide emissions were discussed: changing the fuel composition (cetane/alpha-methylnaphthalene mixtures), the use of various ignition accelerators, recycling of the exhaust gas, changing the fuel-injection timing, or introduction of water into the combustion chamber.

14007

Hsieh, Yu Hsioh

AN EXPERIMENT IN THE PRODUCTION OF NITROGEN FROM NITRIC ACID PLANT TAIL GAS. (Ts'ung hsiao suan wei ch'i chih ch'i t'an ch'i ti shih yen). Text in Chinese. K'o Hsueh T'ung Pao, vol. 10: 307-308, 1957. 6 refs.

By passing nitric acid tail gas first an alkali scrubbing tower to remove CO_2 and then through a catalyst reactor to reduce NO_2 and O_2 in the presence of excess hydrogen, it was found practical to recover nitrogen. Three types of catalysts were made by depositing Cu and Ni on soil diatoms: CuO:diatoms, NiO:diatoms, and CuO plus NiO:diatoms, all in a 1:9 ratio. The highest absorption rate could be attained with a sodium hydroxide concentration of 1% and a gas linear velocity of 0.2 m/sec. The concentration of CO_2 could be reduced to 30 ppm. By using CuO with a firebrick carrier at a temperature of 600-650 C, a space velocity of 6000 reciprocal hours, and 4-6% excess hydrogen, it was possible to produce a gas with 1-5 ppm NO, 10-20 ppm O_2, and 400 ppm NH_3. By using the copper-nickel catalyst with diatoms as carriers at a temperature of 300-500 C, a space velocity of 1500 reciprocal hours, and 5% excess hydrogen, a gas with 0.4-0.7 ppm NO, 10-20 ppm O_2, and 300-500 ppm NH_3 could be produced with the content of noxious gas within acceptable limits. The temperature of reaction increases rapidly with oxygen content of the tail gas and with space velocity. Since the reactor was of simple construction, there was no way to control the temperature, and no tests were performed under conditions of low temperature and high space velocity.

14025

Ryason, P. R. and J. Harkins

STUDIES ON A NEW METHOD OF SIMULTANEOUSLY REMOVING SULFUR DIOXIDE AND OXIDES OF NITROGEN FROM COMBUSTION GASES. J. Air Pollution Control Assoc., 17(12):796-799, Dec. 1967. 13 refs.

In this study, a high-sulfur fuel was used and SO_2 concentrations were measured ahead of and following the catalyst bed to test the simultaneous reduction of SO_2 and NO. Synthetic gas mixtures of SO_2 in N_2 and CO plus CO_2 in N_2 were combined in various proportions as the reactant gases. A number of different metals, supported on an alumina extrudate or on a silica gel, were tested for the reduction of SO_2. The test gas contained twice the stoichiometric amount of CO. Tests for SO_3 in the offgases were negative, as expected in a reducing atmosphere. The COS concentration depended on the composition of the reaction gas mixture. Generally the mixtures stoichiometric in CO showed somewhat less reduction than did the mixtures containing a twofold excess of CO. Reactant gas mixtures containing excess CO deposited sulfur in the cooler parts of the apparatus downstream from the catalyst bed, but this amount was negligible. To utilize the reduction reactions in a practical system at relatively high dilutions requires a catalyst, the most active being copper supported on alumina. Substantial reduction (90% or greater) can be achieved in 0.35 sec, corresponding to a space rate of 10,000 vol/vol/hr. A side reaction of carbon monoxide with elemental sulfur to form CCS requires that the initial amount of CO be stoichiometric for the amount of SO2 plus the NO present. To employ this method for the purification of flue gases would require near stoichiometric fuel air operation of the furnace. Thermodynamic considerations show that the optimum initial ratio of CO to SO2 is somewhat less than 2 to minimize the production of carbonyl sulfide. Substantial reduction of undesirable sulfur compounds and essentially quantitative reduction of oxides of nitrogen are possible with this method.

14031

Harris, Samuel W., Edwin F. Morello, and Gavin H. Peters

PROCESS FOR DECOMPOSITION OF OXIDES OF NITROGEN. (Standard Oil Co. Inc., Chicago) U. S. Pat. 3,459,494. 2p., Aug. 5, 1969. 4 refs. (Dec. 14, 1966, 10 claims).

A process is claimed that can provide as high as 98 to 100% decomposition of nitrogen oxides into nitrogen and oxygen. The method consists of contacting nitrogen oxides with a high-melting solid catalyst selected from at least one member of the group comprised of alkali metal oxides, alkali metal silicates, alkaline earth metal oxides, alkaline earth metal silicates, and mixtures of these, at a temperature above 700 C for a time sufficient to accomplish the conversion. The contact of the nitrogen oxides with the catalyst should take place between about 700 C and 1100 C, and preferably between 800 C and 1000 C. The degree of decomposition will depend upon the particular catalyst and temperature used. Operating details and possible variations of the process are described. The effectiveness of the method contradicts previous assumptions of the great difficulty of carrying out such decomposition, and by eliminating the use of platinum and paladium as catalysts, reduces the cost and adds to the commercial significance of this conversion technique. The high degree of conversion would make possible the use of the resulting air mixture for human consumption; by producing a breathable, oxygen-enriched atmosphere, the process may have applications in space travel, reduction of air pollution from industrial gas streams, purification of automobile exhaust gases, and reduced smog formation. For example a modification of the process is described which produces automobile exhaust emissions substantially free of all harmful nitrogen oxides; it is also contemplated that by use of this method, solid ammonium nitrate grains may be used as the source of nitrogen oxides in space exploration.

14034

Benson, Jack D.

REDUCTION OF NITROGEN OXIDES IN AUTOMOBILE EXHAUST. Preprint, Society of Automotive Engineers, Inc., New York, N. Y., 17p., 1969. 11 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690019.)

One of the reactants involved in photochemical smog is NOx, defined as the sum of nitric oxide (NO) and nitrogen dioxide (NO2) concentrations; NO, emitted by automobiles in exhaust gas, slowly oxidizes to NO2 under atmospheric conditions. Although the control of nitrogen oxides from automobile exhaust is not yet required by law, several methods were investigated to determine how much control is possible and what penalties result. These methods involved spark timing, carburetion, and exhaust recirculation. On one test car, a control system was developed which reduced nitrogen oxides 74% while maintaining hydrocarbon and carbon monoxide control at current (1968) federal levels. However, a 13% loss in fuel economy was incurred, and driveability problems were observed. Application to other car models, deposit accumulation, durability, and performance under extreme weather conditions are all open questions at this time. (Author abstract modified)

14036

Taylor, R. E. and R. M. Campau

THE IIEC - A COOPERATIVE RESEARCH PROGRAM FOR AUTOMOTIVE EMISSION CONTROL. Proc. Am. Petrol. Inst., Sect. III, vol. 49:309-327, 1969. 5 refs.

The Inter-Industry Emission Control Program, which now is comprised of six petroleum companies and five automobile manufacturers (including four foreign firms), was established in 1967 and expanded in 1968 to pool the research efforts of the two industries in the design and development of a virtually emission free, gasoline-powered vehicle. Specific targets call for a 90 to 97% reduction in the hydrocarbon, carbon monoxide, and nitrogen oxide emissions of a typical vehicle and are aimed at improving the quality of the Los Angeles Basin, considered the most critical air shed area in the United States. Of some 17 research projects begun under the program, those associated with catalysts, thermal reactors, exhaust gas recirculation, and modification of fuel properties are receiving the major current attention, using techniques ranging from mathematical modeling to component hardware development and testing, to the building and testing of complete concept cars, which combine various emission control sub-systems into fully-functioning automobiles for total emission evaluation, durability testing, and product acceptability evaluation. Descriptions of the various research problems and methods are given. Because of Federal emissions testing requirements, much of the total effort is directed toward designing exhaust control systems that can operate at high efficiency almost from the moment of engine start-up. Summaries are given of the investigations underway that deal with the fuel and hardware components of a spark ignition engine; these involve the development of additives to suppress nitrogen oxide formation, hydrocarbon combustion-improving additives, hydrocarbon deposit-modifying additives, surface tension and emulsifying agents, and the study of the effect of fuel volatility on exhaust and evaporative emissions.

14054

Ganz, S. N.

ABSORPTION OF NITROGEN OXIDES BY SOLID ABSORBENTS. PART I.

(Pogloshcheniye okislov azota tverdymi sorbentami. Soobschcheniye I). Text in Russian. Zh. Prikl. Khim., vol. 31:138-140, 1958. 5 refs.

In a search for an effective solid absorbent for low-concentration (0.3-0.25%) nitrogen oxides, experimental studies were made with activated carbon, aluminum silicate, silica gel, manganese dioxide, cupric oxide, hopcalite, and coke in conjunction with industrial gas from a nitric acid plant. Data reflecting the relative effectiveness of these absorbents are plotted and indicate the descending order given above. Hopcalite, MnO_2, CuO and coke were difficult to regenerate, the first three of these being unsuitable because of the chemical nature of their action. Complete desorption of nitrogen oxides from carbon, aluminum silicate, and silica gel is difficult, requiring temperatures on the order of 200-350 C. Aluminum silicate is regarded as the most suitable material based on its sufficiently high absorbing capability, high mechanical strength, and ability to undergo high-temperature regeneration.

14073

Lozhkin, A. F. and N. L. Subocheva

RECOVERY OF NITROGEN OXIDES FROM LOW-CONCENTRATION GASES WITH ACTIVATED CARBON IN A MOVING LAYER. (Ulavlivaniye okislov azota iz nizkokontsentrirovannykh gazov aktivirovannym uglem v podvizhnom sloye). Text in Russian. Sb. Nauchn. Tr. Permsk. Politekhn. Inst., no. 18:61-74, 1965. 14 refs.

The absorbing capacity of grades KAD and AG activated carbon were found to be comparable when used in a stationary or moving layer to absorb nitrogen oxides in low concentration (about 1%). It was found that the higher the state of oxidation of the nitrogen oxides present, the greater the absorbing capacity of the activated carbon. The possibility of determining the linear rate of carbon motion from data on the displacement of a point of constant concentration in a stationary layer is verified. During thermal regeneration, the absorbed nitrogen dioxide dissociates into nitric oxide and oxygen, and there is an accompanying combustion loss of carbon with the formation of CO_2. This carbon loss amounts to about 0.5% of the starting weight for KAD, and 0.4% for AD carbon.

14093

Kopa, R. D., R. G. Jewell, and R. V. Spangler

EFFECT OF EXHAUST GAS RECIRCULATION ON AUTOMOTIVE RING WEAR. J. Air Pollution Control Assoc., 12(5):246, 247-254, May 1962. 6 refs.

As a means of controlling nitrogen oxides in automobile exhausts, it was found that exhaust gas recycling offers an effective method of controlling combustion temperature with the result that less nitrogen oxides are formed. To determine how exhaust gas recycling affects engine wear, a cooperative research program was undertaken by the Department of Engineering, University of California and the Research and Development Center of the

Richfield Oil Co. At steady state engine operation, a 90% reduction of piston ring wear was registered when about 12% of the exhaust gas was recirculated back to the inlet manifold. Experiments performed under simulated traffic conditions resulted in a 50% reduction of piston ring wear when 12% of the exhaust gas was recycled. The temperature of the recycled gas did not alter the ring wear reduction effect. However, when condensed water entered the engine inlet manifold, a substantial wear increase of the piston rings was recorded. No adverse effects resulting from exhaust gas recirculation regarding engine deposits and cleanliness were observed. No attempt was made to find more optimal conditions by changing the standard tune-up of the engine with respect to spark timing or air-fuel ratio carburetor settings. (Author conclusions modified)

14159

Thomas, Fred W.

TVA'S AIR QUALITY MANAGEMENT PROGRAM. Proc. Am. Soc. Civil Engrs., J. Power Div., Paper 6483:131-143, March 1969. 18 refs.

The air quality program of the Tennessee Valley Authority as related to its fertilizer and coal- and nuclear-fired power plants is reviewed. Preventive aspects of pollution control are basic to the program designed for steam-electric generating plants. Plants are located at sites where terrain is favorable to effective dispersion, and air quality measurements are recognized in planning and designing plant structures. The program is supplemented by an extensive monitoring system for measuring sulfur dioxide, fly ash, ozone, and nitrogen oxide emissions. Mobile sampling equipment is used in conjunction with stationary monitoring systems because it appreciably shortens the period required to define air quality in the vicinity of a plant. TVA also conducts extensive research studies on plume dispersion, levels of ground level fumigation during inversion breakup, and chemical processes for the removal of SO2 from flue gas. At nuclear plants, an extensive network of instruments monitors airborne particulates, radioiodine, heavy particulate fallout, and rainwater. TVA has sought to prevent deleterious effects from SO2 emissions primarily through the use of high stacks designed to limit SO2 concentrations at ground level. As unit size and plant capacity increase, stack heights are being raised from 170 to 800 to 1000 ft. With increasing worldwide attention focused on techniques for converting SO2 to sulfuric acid or fertilizer, TVA is now exploring the use of limestone in pulverized coal-fired units and cyclone-furnace units. Where fly ash creates a nuisance problem. TVA is substituting 95% efficiency precipitators for mechanical collectors.

14196

Peters, M. S.

CAUSES, IMPORTANCE AND CONTROL OF NITROGEN/OXYGEN COMPOUNDS IN THE FIELD OF AIR POLLUTION. (Ursachen, Bedeutung und Kontrolle der Stickstoff/Sauerstoff-Verbindungen in der Luftverunreinigung). Text in German. Chem. Ing. Tech., 41(10):593-644, May 1969. 13 refs.

In heavy smog, nitrogen oxide concentrations of 1 to 3 ppm have been measured over some cities. Physiological effects on humans have been observed at 3 ppm and 8 hours of exposure. The nitrogen oxides in the atmosphere come mostly from motor vehicles and power plants, as well as from chemical plants, such as nitric acid production plants, plants for the recovery of catalysts, pickling plants, etc. In the gasoline powered engine, a high nitric oxide concentration is formed at ignition temperature (2200 C). Since the gases cool rapidly to ambient temperatures, no equilibrium conditions can be attained and the nitric oxide concentration of exhaust gas is rather high. There are two possible methods of avoiding this. The ignition temperature should be lowered or the gas should be cooled at a slower rate. Otherwise, a catalyst should be found which speeds decomposition of nitrogen oxides at low temperatures. There are also several methods for reduction of nitrogen oxides from stack gases. Adsorption on zeolites and certain other types of molecular sieves is a rather promising method. Intense research on these methods is recommended, since little is known about them.

14202

Bjerklie, J. W. and B. Sternlicht

CRITICAL COMPARISON OF LOW-EMISSION OTTO AND RANKINE ENGINE FOR AUTOMOTIVE USE. Preprint, Society of Automotive Engineers Inc., New York, 16p., 1969. 16 refs. (Presented at the International Automotive Engineering Congress, Detroit, Mich., Jan. 13-17, 1969, Paper 690044.)

Rankine cycle external combustion engines, which are currently used for low emission power plant systems, are considered in terms of their application to automobiles meeting future pollution requirements. A comparative study of theoretical reciprocating and rotary Rankine cycle engines using steam and organic fluids with existing Otto automotive engines indicates that the performance of the former should be superior with respect to size, torque, economy, emission, response, maintenance, and reliability. Use of external combustion, which means that the engine can use the same fuel burned in power plants, will reduce fuel cost and produce inherently lower emissions. With presently available fluids and with the most practical machinery presently known, the steam reciprocator is best able to compete with the Otto cycle engine. However, development of an 'ideal' low temperature, nontoxic, nonflammable fluid should lead to vapor engines significantly better than the reciprocating steam engine. These engines will require no regenerator or superheater and will not have the cost and size disadvantage of the steam system. Reciprocating vapor engines will develop very high torque merely by feeding high pressure vapor to the cylinder. It is hoped that chemical and petrochemical companies will concentrate on the development of the 'ideal' fluid.

14255

Paleari, C. and F. Renzanigo

COMBUSTION PRODUCTS OF DIESEL FUEL. I. THE EFFECT OF AN

IGNITION IMPROVING ADDITIVE ON THE NITROGEN OXIDE AND CARBON MONOXIDE CONTENT. (Prodotti di combustione di combustibili diesel. I. Effetti di un additivo promotore di accensione sui contenuti in ossido di azoto ed ossido di carbonio). Text in Italian. Riv. Combust., vol. 13:419-431, June 1959. 3 refs.

Investigations were made on the effect of gasoil compositions, the presence of ignition improvers, and of engine operation conditions on the nitrogen oxide and carbon monoxide content of a C.F.R. F-5 engine exhaust gas. With all the gasoils used during these tests, the highest nitrogen oxide contents were observed when the engine was running on intermediate loads. The effect of additives was seen only when the engine ran at minimum speeds. It was found that nitrate base additives reduce the exhaust gas CO content, particularly with low cetane number gasoils in engines on high loads. (Author summary modified)

14297

Hind, C. J.

CLEAN AIR AND THE DIESEL. Indian Eastern Engr. (Bombay), 111(2):77-79, Feb. 1969.

A defense of the diesel engine against criticism that it is a heavy contributor to air pollution is presented. Under ideal conditions if all gasoline engines were replaced by diesel engines, the emission of carbon monoxide, aldehydes, and nitrogen oxides would be reduced, carbon dioxide, hydrocarbons, and soot would be increased, and sulfur dioxide would be unchanged. Carbon dioxide is not seen as a health hazard, and hydrocarbons are not considered dangerous, as they are in parts of the U. S., because the other conditions necessary for the creation of photochemical smog, particularly climatic factors, are not present in the U.K. Carbon monoxide, possibly the emission most hazardous to health, would be reduced to almost negligible amounts. Sulfur dioxide would necessarily be kept to a minimum, since in diesel engines the sulfur content of the fuel is deliberately kept very low to reduce internal corrosion of engines. In addition, because the diesel engine is more efficient than the gasoline engine, the absolute quantity of fuel oil used would be reduced, thus lowering the total impurities discharged into the atmosphere. Efforts are underway to reduce the major pollutants from diesels: smoke (carbon) and odor (sulfur dioxide). Supercharging by making use of energy remaining in the exhaust gases to drive a turbine and compressor, is seen as one way of maintaining a satisfactory fuel/air ratio for smokeless operation and greater efficiency as fuel input is increased. Improvements in the combustion process are being investigated as an engineering goal and to reduce odorous emissions.

14309

Hunter, J. B.

PLATINUM CATALYSTS AND AIR POLLUTION CONTROL. S. African Mining Eng. J., 1968:438-440, Feb. 23, 1968. 1 ref.

A ceramic platinum catalyst support in the form of a honeycomb-like structure is described. The catalyst is a highly active platinum tightly anchored to a ceramic base by a new proprietary technique. This concept in catalyst packaging not only protects the ceramic structure against breakage but also allows for catalyst interchangeability. These catalysts were found to be useful in eliminating nitrogen oxide fumes in systems where natural gas and purge gas were used as fuels. Examination of the catalyst after six months of operation showed no sign of deterioration. The catalysts were found to be effective for complete oxidation of organic contaminants and also in nuclear power installations where intense radiation causes the decomposition of water and the gradual rise in concentration of a hydrogen/oxygen mixture in a closed loop system. A major advantage of the honeycomb catalyst is its exceptionally low pressure drop. Other advantages include more uniform gas distribution, greater structural strength, no attrition or loss of fines, and no channelling or hot spots. From the standpoint of system design, the rigid structure also provides greater process flexibility.

14325

Lee, G. and A. C. Coulson

EUROPA 1. THE DESIGN AND DEVELOPMENT OF GAS SCRUBBERS FOR THE EUROPA 1 UPPER STAGES PROPELLANT SYSTEMS. Weapons Research Establishment, Salisbury, S. Australia, Dept. of Supply, TN DWD 22, 65p., Aug. 1968. 24 refs.
CFSTI: N69-27758

The design and development of gas scrubbers for the removal of N204, unsymmetrical dimethylhydrazine, and Aerozine 50 from nitrogen carrier streams are described. The final scrubber incorporates eight stages fitted with sieve plates made out of an aluminum alloy. At the base of the unit, a stainless steel float valve controls the water outlet flow and maintains a gas-tight seal. The water flow-rate can be set at 0.5 gal/min. In the launcher installation, the umbilical mast vent lines to the fuel and oxidant scrubbers serving the second stage are fitted with nozzle plates at the scrubber inlet flange. These control the gas flow rate. The vent lines from all the other places are fitted with a flowrator and control valve, the arrangement being that manual control can limit the gas flow rate and maintain it while the pressure falls. To allow for imperfect scrubbing of N204 in the gas streams, the vent gases are led to 45 ft-high stacks situated 750 ft from the installations, and the effluent water is piped to soakage pits located at safe distances from inhabited areas. From the results, it was clear that high efficiencies are obtainable when stripping the fuel gases from an inert stream, but it is not possible at any gas flow rate to remove N204 down to 5 ppm using this technique. In trying to produce a scrubber system capable of coping with the high impulsive flows, it is probable that the best compromise for a gas scrubber was achieved. The scrubber is best suited to constant flow conditions or to flow conditions which have a limited range of variation.

14333

Dwyer, F. G.

CATALYST SYSTEM MORPHOLOGY AND DESIGN. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia., Pa., Nov. 1968, p. 73-86. 13 refs.

Common gaseous pollutants that are amenable to catalytic transformation are discussed. Sulfur dioxide is eliminated by catalytic hydrodesulfurization, oxidation with a vanadium pentoxide catalyst, or reduction with carbon monoxide in flue gases. Nitrogen oxides are eliminated by reduction with chromite and copper oxide catalysts, which lose their effectiveness. Carbon monoxide is removed from atmospheric gases by catalytic oxidation. More is known about the mechanism of CO oxidation, which is catalyzed by transition metal oxides and noble catalysts, than about any other methods. Carbon monoxide also can be oxidized in the presence of H_2 over MnO_2, and indium doped ZnO, based on electronic charge transfer. Mechanisms for the oxidation of hydrocarbons are similar to those for CO oxidation but more catalyst efficiency. Interaction of gaseous pollutants presents a problem in finding the right catalyst. The complexity of the problem is seen in the exhaust from internal combustion engines. Here, CO and unburned hydrocarbons are converted by catalytic oxidation and nitrogen oxides are converted by catalytic reduction. The transition metal oxide and noble metal catalysts must be supported on a base for ease of handling, cost, and thermal stability. Problems encountered in treating industrial gas streams are those of dilution. A further complication arises if the diluent interferes in some manner with the reaction being catalyzed. Poisoning effects, which are present in all heterogeneous catalytic reactions, must also be considered. Although none of the catalysts is a panacea, each brings the solution of air pollution closer.

14355

Fukui, Syoze

HYGIENIC CHEMICAL STUDIES ON PUBLIC NUISANCE BY INJURIOUS GASES. XI. FUNDAMENTAL STUDIES ON REMOVAL OF NITROGEN OXIDES FROM GASES BY THE TREATMENT WITH AMMONIA (NO. 2). ON THE MECHANISM OF REACTION BETWEEN NITROGEN OXIDES AND AMMONIA. (Yudoku gasu ni yoru kogai no eisei kagakuteki XI. Anmoniya shoriho ni yoru Chisso sankabutsu no jokyoho (sono 2). Chisso sankabutsu to anmoniya no hanno kiko). Text in Japanese. Eisei Kagaku (J. Hyg. Chem.), 13(1):22-28, 1967. 8 refs.

Treatment of waste gases with ammonia has previously been found effective in removing nitrogen oxides. The present investigation concerns the mechanism of the reaction between nitrogen oxides and ammonia in the gas phase. The reaction proceeds according to the equation $2NO_2$ plus $2NH_3$ yields NH_4NO_3 plus N_2 plus H_2O. If the ammonium nitrate produced by the reaction is removed by some mechanical means, the only gase emitted will be nitrogen. Since nitric oxide did not react with ammonia, it was oxidized to nitrogen dioxide or nitrous anhydride by air and treated with ammonia. The reaction between nitrous anhydride and ammonia is N2O3 plus 2NH3 yields NH4NO2 plus N2 plus H2O. (Author abstract modified)

14387

Nabiyev, M. K., A. A. Kulik, P. T. Merenkov, and A. D. Tikhonenko

PURIFICATION OF NITROGEN OF EXHAUST GAS IN THE PRODUCTION OF WEAK NITRIC ACID FOR THE SYNTHESIS OF AMMONIA. (Ochistka azota vykhlopnogo gaza pri proizvodstve slaboy azotnoy kisloty dlya sinteza ammiaka). Text in Russian. Dokl. Akad. Nauk Uz. SSR, 20(11):17-20, 1963. 9 refs.

The small amount of nitrogen oxides in exhaust gases was reduced by natural gas using a nickel catalyst. On a platinum-nickel catalyst, a volume rate of 2800 cu cm was obtained. Complete purification occurred at 500-600 deg. The resulting gas containing 93.85% nitrogen, can be used for the synthesis of ammonia. A method is proposed for a single-step conversion to a nitrogen-hydrogen mixture using water vapor and nitrogen obtained by catalytic purification of exhaust gas.

14389

Perov, Ye. V.

ABSORPTION OF NITROGEN OXIDES BY MAGNESIUM, STRONTIUM, AND BARIUM HYDROXIDES. (Pogloshcheniye okislov azota gidratami okislov magniya, strontsiya, bariya). Text in Russian. Tr. Novocherk. Politekhn. Inst., vol. 121:57-60, 1961. 4 refs.

Absorption of nitrogen oxides in concentrations of 0.25, 0.5, and 1.0% with a flow rate of 0.5 liter/min at 25 and 35 C over powdered magnesium hydroxide with a moisture content of 3% was studied experimentally. Absorption rate was found to drop off considerably after 60-70 min, at which time the absorbent may be washed with water to remove magnesium nitrate and nitrite. Experiments with Ba(OH)2-8H2O and Sr(OH)2-8H2O were carried out at 15 C with a nitrogen oxide concentration of 0.5% and a flow rate of 0.5 liter/min. The strontium hydrate crystals retain their physical properties much better than does the barium hydrate, which readily deliquesces, making it difficult to use as an absorbent.

14481

Van Der Drift, J.

CATALYTIC REMOVAL OF NITROGEN OXIDES FROM WASTE GASES OF NITRIC ACID PLANTS. A METHOD FOR THE PREVENTION OF AIR POLLUTION. (Katalytische verwijdering van N-oxyden uit afgewerkte gassen van salpeterzuurfabrieken. Een methode voor de bestrijding van luchverontreiniging). Text in Dutch. Chem. Tech. (Amsterdam), 24(10):301-305, 1969. 11 refs.

Removal of nitrogen oxides from nitric acid plants can be achieved by catalytic decomposition or reduction. The catalytic decomposition follows the reaction 2NO yields N_2 plus O_2. With a copper-silica gel catalyst, the nitrogen oxide content of waste gas was reduced from 892 to 277 ppm at 510 C. The reduction method uses hydrogen, natural gas, or ammonia as reducing agents. Various installations for the removal of nitrogen oxides from waste gases are described. A heat exchanger is used to lower the temperature of waste gases from around 515 C to 300 C after reduction. Several commercial catalysts are described. In an experiment using Honeycombgrid HCM-S-900 and ammonia, waste gas of 100,000 vol/vol catalyst/hr containing 0.3% nitrogen oxides and 3% O_2 (inlet temp. 286 C) was reduced to 50 ppm NO_2 and 86 ppm NO plus NO_2. Using 0.3% Pt on a Torvex ceramic honeycomb and natural gas, waste gas of 100,000 vol/vol catalyst/hr containing 0.3% nitrogen oxides and 2.58% O_2 (inlet temp. 440 C) was reduced to 58 ppm nitrogen oxides.

14533

A METHOD FOR THE RECOVERY OF NITROGEN OXIDES. (Werkwijze voor het winnen van stikstofoxyden). Text in Dutch. (Universal Oil Products Co., Des Plaines, Ill.) Dutch Pat. 6,607,036. 13p., Nov. 25, 1966. (Appl. May 23, 1966, 8 claims).

The system is particularly suited to handling tail gases from a nitric acid factory and from the lead chamber process of a sulfuric acid factory. This method also gives a distinct improvement in the output of a nitric acid plant. The waste gas is passed over a bed of adsorbing coal particles followed by a hot fluid desorption medium to remove the adsorbed nitrogen oxides from the particles. The desorption medium consists of steam at about 10 atm at a temperature greater than 157 C and preferably more than 177 C. The nitrogen oxide-containing steam is cooled and the mixture obtained is returned to the adsorption zone of the nitric acid plant. The desorption medium can also be hot air. The depth of the bed should not exceed 0.3m to prevent a large pressure drop. The stream waste gas through the adsorption bed is diverted upon saturation with nitrogen oxides to another bed of adsorbing coal. The coal in the first bed is then desorbed until the second bed is saturated and the cycle is repeated. Waste gas from sulfuric acid plants is treated the same way. The advantages of this method are better removal of nitrogen oxides with cost reduction, since no extra fuel is required. Due to integration of the units for preparation of acid and for recovery, higher output is obtained; output of a nitric acid plant can be increased by 5% by more complete use of NO_2.

14531

Eyzat, P. and J. C. Guibet

SIMULATION OF THE FORMATION OF NITRIC OXIDE DURING COMBUSTION IN AN ENGINE. (Simulation de la formation d'oxyde nitrique au cours de la combustion dans un moteur). Text in French. Rev.

Inst. Franc. Petrole Ann. Combust. Liquides (Paris), 22(10):1530-1548, 1967. 3 refs.

Simulation of nitric oxide emission in engine exhaust gases by calculation from the pressure-time diagram was used in a computer program to determine the best combustion process with respect to nitric oxide formation and engine efficiency. The calculation of the pressure time diagram was first reviewed. Optimum operation was shown to correspond to rapid and relatively late combustion. The theoretical calculations of optimum combustion could be at least partially reproduced in actual running conditions.

14554

Stezhenskiy, A. I. and V. S. Luk'yanchikov

NITRIC OXIDE FORMATION IN GAS TURBINES. (Ob obrazovanii okisi azota v kamerakh sgoraniya gtu). Text in Russian. Fiz. Goreniya, Akad. Nauk Ukr. SSR, Respub. Mezhvedom. Sb., 1966:91-93. 5 refs.

It is estimated that existing gas turbines discharge 3 kg of NO2 per ton of natural gas consumed, or 720 tons of NO2 per 1000 kW of useful power per year. The NO concentration in gas turbine exhaust reaches 0.2 vol %. Calculations indicate that cooling of the exhaust gases with secondary air at a rate of 1000 deg/sec will assure almost complete dissociation of NO to N2 and O2.

14604

Hamblin, R. J. J. and W. J. Faust

CATALYTIC SYSTEMS FOR LEADED AND UNLEADED GASOLINE EXHAUSTS. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 131-159.

The problems of achieving complete catalytic combustion of oxidizable components other than unburned hydrocarbons, carbon monoxide, and nitrogen oxides are discussed. A catalyst placed in the exhaust system must be capable of dealing with lead, halogens, sulfur, and phosphorus in all combinations with oxygen and with each other. The catalyst must have a size and shape consistent with requirements for good flow distribution and low pressure drop. The catalyst bed itself and the individual particles must also not be subject to plugging by particulate matter. A catalytic converter lowers the concentrations of all pollutants in the exhaust gas stream and does not manufacture any new ones. The automobile manufacturers achieved significant reductions in carbon monoxide and hydrocarbon emission levels by controlling carburetion and ignition and by adding secondary air to the exhaust system. However, the still lower levels of emission desired after 1970 will be difficult to attain without further losses in vehicle performance. They may even be unattainable without catalytic converters. The use of present-generation catalysts may permit the recovery of the performance that already is sacrificed by engine modifications. The development of catalysts which can operate successfully for extended mileage on leaded fuels was accomplished. The performance of catalysts on unleaded fuels is outstanding. With leaded or unleaded fuel, a catalytic converter coupled closely to the exhaust manifold, under any engine operating conditions, assures lower emission levels than any other system.

14630

Schmidt, Alfred and Ferdinand Weinrotter

PROCESS AND EQUIPMENT FOR THE REMOVAL OF NITROUS GASES FROM WASTE GASES. (Verfahren und Vorrichtung zur Entfernung von nitrosen Gasen aus Abgasen). Text in German. (Lentia G.m.b.H., Munich) W. German Pat. 1,075,571. 4p., Feb. 18, 1960. 1 ref. (Appl. May 2, 1958, 7 claims).

A process is described for the removal of nitrous gases from waste gases, primarily from nitric acid factories. These gases are treated with a solution of magnesium nitrite, nitrate, and magnesium hydroxide and carbonate. Magnesium hydroxide and carbonate bind nitrous gases by forming magnesium nitrite. The latter is decomposed by heating to temperatures between 140 and 200 C at 3 to 6 atm according to the equation 3Mg(NO2)2 plus 2H2O yields Mg(NO3)2 plus 2Mg(OH)2 plus 4NO. A scrubbing solution concentration of 200 to 300 g magnesium nitrite/l must be maintained. The solid substance in the solution may not exceed 20%. The NO liberated in the process can be re-used, and the magnesium hydroxide which separates in crystal form can be recirculated. Alkali or alkali earth nitrates are added to the magnesium nitrite solution prior to re-use of the scrubbing solution. The equipment for the process consists of a conventional scrubber, a container heated by pressurized steam for decomposition of the magnesium nitrate lye, a reaction chamber, a chamber for oxidation of NO, and inlet, outlet, and return pipes.

14631

METHOD FOR THE COMPLETE REMOVAL OF NITROGEN OXIDES. (Werkwijze voor het volledig verwijderen van stikstofoxyden). Text in Dutch. (Hibernia-Chemie G.m.b.H., Gelsenkirchen-Buer, West Germany and Harry Pauling, Munich) Dutch Pat. 6,606,577. 13p., Nov. 21, 1966. (Appl. May 13, 1966, 23 claims).

The invention describes a method for the complete removal of nitrogen oxides from waste gases using ammonia with recovery of nitrogen as ammonium nitrate. First, the nitrogen oxides are completely oxidized and the mixture of NO and NO2 is washed with ammonium nitrate solution of fixed maximum and minimum ammonia content, i.e., a maximum water vapor: ammonia ratio of 2:1 and a minimum ratio of 100:1. The ammonium nitrite-containing solution obtained is converted into ammonium nitrate solution with the help of nitric acid. The concentration of ammonium nitrate in the solution should be so high that its viscosity is equal to or greater than that of water at the same temperature; at a working temperature of 20-30 C, this concentration should be from 40 to 50% by weight. There should be at least two, and prefereably three or more washers and the solution passing through the scrubbers should contain at least 0.5-5% by wt free ammonia. Each washing stage in the gas washer installations should have its own inlet and outlet so that they are connected in series in the direction of gas flow and in parallel in the direction of solution flow. The degree of oxidation of the gas, after passing through half or 2/3 of the washing stages, is corrected to 50%. A washing stage with mild nitric acid should be added after the washing stages with ammonia. The nitric acid content of the ammonium nitrate solution is fixed to be 0.5-1.5% and never to exceed 3%. The solution is vigorously stirred after mixing with air circulation. The nitric acid ammonium nitrate solution is circulated with one or more giant air pressure pumps and cooled if necessary.

14632

Haagen-Smit, A. J.

REMOVAL OF PARTICULATE AND GASEOUS CONTAMINANTS FROM POWER PLANT FLUE GASES. Air Pollution Control Assoc. Los Angeles West Coast Section, Proc. Tech. Meet. Air Pollution Control Assoc., West Coast Sect., 1st, Los Angeles, 1957, p. 102-110.

Methods for the removal of power plant flue gases are discussed. Two pilot plants in operation at the El Segundo Steam Station are working on the reduction of sulfur trioxide. One is an APRA unit working on the hot side of the air preheater, and the other is a Western Precipitation unit operating on the cold side of the air preheater. Many schemes for the removal of sulfur dioxide and nitrogen oxides are also being tested with flue gases pumped from one stack through the laboratory and out to the other stack. Through the loop in the flue gas line goes 100 cu ft/min of flue gas of relatively constant composition and temperature. Processes such as washing with water to remove SO_2 were considered but were not economically feasible for large plants. Other processes, such as scrubbing with ammonium sulfite are not applicable in their present state to stack gases containing low concentrations of SO_2 found from the combustion of oil. A dry scrubbing method using adsorption charcoals has promise in that charcoal has a remarkable ability to remove sulfur from large volumes of flue gas and can be reused. Since considerable adsorption of SO_2 from flue gas is possible at 150 F, cooling the gas is not necessary. The desorption can be accomplished with steam, aqueous ammonia, or heating. In this procedure, SO_2 is recovered in concentrations of 50-75% and NO or NO_2 is also adsorbed. The breakthrough point for nitrogen oxides occurs much earlier than for SO_2. Since the adsorption boundary of SO_2 is sharply defined, there is the interesting possibility of eluting the two components separately at different column heights. A continuous flow system could then be adopted for each of the sections. For the control of nitrogen oxides, the possibility exists of decomposing them. Another approach consists of reduction with carbon, CO, hydrogen, or methane. Application of this method to the power plant problem is difficult, because flue gas contains excess oxygen which rapidly consumes available reducing agents. Nitrogen oxides removed by oxidation with HNO_3 does not work at low temperatures. A great deal of research is needed to make these proposed schemes economically feasible.

14633

Varshavskiy, I. L., L. S. Zolotarevskiy, and A. I. Frenkel'

ON THE LIBERATION OF NITROGEN OXIDES IN ENGINES WITH EXTERNAL CARBURETION OPERATING ON FUEL GASES. (O vydelenii okislov azota v dvigatelyakh s vneshnim smeseobrazovaniyem, ispol'zuyushchikh gazovoye toplivo). Text in Russian. Gaz. Prom., 11(7):36-39, 1966. 6 refs.

It was experimentally confirmed that the principle pollutants from engines operating on fuel gases with lean mixtures are nitrogen oxides. There are two approaches to the reduction of these pollutants: shift to a richer mixture (alpha less than 0.9) or to a leaner mixture (alpha greater than 1.35); the first being used only in special cases because of the resultant high fuel consumption rate. Adjustment to give minimum yield of nitrogen oxides requires a leaner mixture than is possible for gasoline-operated engines. The use of fuel gases for automobiles operating in large cities is seen as a possible prospect.

14664

Atsukawa, Masumi, Yoshihiko Nishimoto, and Naoyuki Takahashi

STUDY ON THE REMOVAL OF NITROGEN OXIDES FROM EFFLUENT STACK GASES. Mitsubishi Heavy Industries, Ltd., Tech. Rev., 5(2):129-135, May 1968. 9 refs.

Pilot plant tests of the Mitsubishi process for removing nitrogen oxides from stack gases demonstrate that nitrogen oxides can be economically reduced to less than 0.02% of gas content. By limiting threshold concentrations of nitric acid to 200 ppm or below, the method should meet the removal requirements of the major sources of nitrogen oxide emissions: metal pickling plants, nitric acid plants, chemical plants using nitric acid, nitrate, and nitrite plants. Nitric oxide is converted to NO_2 by either homogeneous or catalytic oxidation, while nitrogen compounds are recovered through absorption of stack gases in wetted-wall towers packed with PVC sheets. Homogeneous oxidation is a slow process and requires large equipment. However, this equipment is easy to operate. Catalytic oxidation can be performed on small-scale equipment, but the catalyst is affected by water, dust, and mist present in the effluent gas and regeneration is necessary. The PVC equipment has a large absorption coefficient and a small pressure drop.

14765

Ryason, Porter Raymond

METHOD OF REMOVING SULFUR DIOXIDE AND NITROGEN OXIDES FROM GASES.

(Chevron Research Co., San Francisco, Cf.) U. S. Pat. 3,454,355. 3p., July 8, 1969. (Appl. May 20, 1966, 6 claims).

A catalytic process for the removal of sulfur dioxide and nitrogen oxides from flue gases is described. The flue gas reacts with a copper, silver, nickel, molybdenum, palladium, or cobalt catalyst on alumina support in the presence of carbon monoxide at 750 F for at least 0.1 sec. The carbon monoxide is at least 75% of the stoichiometric amount necessary to reduce the sulfur dioxide and other oxidizing gases in the mixture.

14801

Constantinescu, Mircea, Eugenia Platon, and Olga Tibrea

PROCEDURE FOR ELIMINATING OXIDES OF NITROGEN FROM GASES USED IN AMMONIA SYNTHESIS. (Procedeu de eliminare a oxizilor de azot din gazele folosite la sinteza amoniacului). Text in Romanian. (Ministry of Chemical Industries, Bucharest) Socialist Republic of Romania Pat. 50557. 2p., Feb. 26, 1968. 1 ref. (Appl. March 18, 1967, 1 claim).

The patented improvement consists of adding 5-60 mg/l sodium dichromate to the wash water, one advantage thus offered being the oxidation of NO to NO_2 and N_2O_3, which then dissolve more readily in the wash water instead of escaping into the air.

14821

Olcott, Thomas M.

DEVELOPMENT AND DESIGN OF AN ISOTOPE-HEATED CATALYTIC OXIDIZER TRACE CONTAMINANT CONTROL SYSTEM (U). Lockheed Missiles and Space Co., Sunnyvale, Calif., Biotechnology Organization, Contract NAS 1-7433, NASA CR-66739, 277p., Feb. 28, 1969. 79 refs.
N 69-18755

The development and design of an isotope-heated catalytic oxidizer trace contaminant control system is described. The program included establishing pre- and post-sorbent bed designs to control potentially poisonous contaminants (e.g., H_2S, NO_2, SO_2, and NH_3) and to control contaminants that might produce undesirable products. Lithium hydroxide was selected as the pre-sorbent material. The sizing of the pre-sorbent bed was accomplished by establishing the stoichiometric quantity of lithium hydroxide required to remove the poisonous contaminants and by establishing a satisfactory dynamic performance level. A trade-off was made between the weight penalty due to the bed and canister fixed weight and the weight penalty associated with the fan head rise required for flow to establish the bed configuration. To determine the pre-sorbent bed requirements, a regenerative charcoal main sorbent bed system, suitable for the proposed program, was postulated, and its effect on the contaminant load was assessed. A 180-day evaluation test of the pre-sorbent bed, catalytic oxidizer, and post-sorbent bed was conducted. Tests established the fabrication and joining techniques and the compatability between the isotope heat source materials of construction. Additional tasks included evaluation of candidate electric heater concepts for use in a simulated isotope heat source and evaluation of thermal insulation concepts. The insulation performance was better than expected and resulted in the reduction in the required insulation thickness from 1.5-1.0 inches. Solid insulation was selected for the final design. The detailed design of the isotope heated catalytic oxidizer system included a stress analysis of the main structure and a review of the thermal characteristics. The resistively heated unit is an exact duplicate of the radioisotope-fueled unit, except that the thermal power is obtained from a resistively heated element located in the fuel cavity, and heater element and thermocouple leads pass through the heat exchanger core. (Author abstract modified)

14850

Trayser, D. A., F. A. Creswick, J. A. Gieseke, H. R. Hazard, A. E. Weller, and D. W. Locklin

A STUDY OF THE INFLUENCE OF FUEL ATOMIZATION, VAPORIZATION, AND MIXING PROCESSES ON POLLUTANT EMISSIONS FROM MOTOR-VEHICLE POWERPLANTS. Battelle Memorial Inst., Columbus Labs., Contract CPA 22-69-9, Phase Rept., 145p., April 30, 1969. 120 refs.

A study of automotive engine induction systems was conducted. The objective of this non-experimental program was to explore incentives and approaches for reducing exhaust emissions by extending the lean-mixture operating limit through improved induction-system performance. The study was divided into four major subtasks: development of mathematical descriptions of induction-system phenomena; evaluation of methods for measuring mixture characteristics; conception of approaches to the definition and measurement of mixture quality; and evaluation of alternative atomization methods. The results of this study indicated that extension of the present limits, made possible by improved air-fuel distribution, can lead to modest but worthwhile reductions in emissions of both unburned hydrocarbons and carbon monoxide and to substantial reductions in the emission of nitrogen oxides. Minimizing or eliminating the liquid-fuel film on the intake manifold walls was concluded to be the most promising approach to achieving improved distribution. The liquid film can be reduced by employing atomizing devices that will produce droplet sizes approaching 10 to 20 microns under all operating conditions, by designing the induction system for minimum impaction of fuel droplets, and by heating the manifold walls to vaporize the fuel that is avoidably impacted. Recommendations included an experimental program comprising the design, fabrication, and evaluation of an induction system with a carburetor employing an alternative, improved atomization device and a low-impaction intake manifold.

14902

Andersen, L. B. and H. F. Johnstone

GAS ABSORPTION AND OXIDATION IN DISPERSED MEDIA.

Am. Inst. Chem. Engrs. J., 1(2):135-141, June 1955. 8 refs.

The absorption and subsequent liquid-phase reaction of oxygen was studied with two types of dispersion apparatus: the Venturi atomizer and the fritted-glass disperser. The systems studied in both devices included the absorption of atmospheric oxygen by catalyzed sodium sulfite solutions and the simultaneous absorption of atmospheric oxygen with nitrogen dioxide and with sulfur dioxide by water. Very large values of the liquid-film mass transfer coefficient for oxygen absorption were measured in the atomization zone of the Venturi atomizer. Over-all recovery efficiencies were less than 2.3% for nitrogen dioxide but reached as much as 22% for sulfur dioxide. Oxidation efficiencies for sodium sulfite solutions ranged up to 80%, depending on the operating conditions. The fritted-glass disperser gave recovery efficiencies of nitrogen dioxide as high as 90% from air containing 10% of the gas. The recovery efficiency decreased at low concentrations of nitrogen dioxide for both the Venturi atomizer and the fritted-glass disperser. (Author abstract modified)

14955

Rabson, S. R.

THE DEVELOPMENT OF AN EXTRACTION PLANT FOR THE ELIMINATION OF BLASTING FUMES. South African Institute of Mining and Metallurgy, Johannesburg, Trans. Seventh Commonwealth Mining and Metall. Cong., vol. 2:759-774, 1961. 20 refs.

Nitrous fumes produce acute toxic effects and, when inhaled in gross concentrations together with siliceous dust, can accelerate the development of silicosis. Methods for extracting the oxides of nitrogen from fumes caused by underground blasting were investigated. A detailed description is given of laboratory work to analyze the composition of fumes released in blasting; the fumes were found to contain nitric oxide, nitrogen dioxide/tetroxide, and nitrogen trioxide, with nitric oxide being the most significant for the problem of fume elimination. Both laboratory extraction tests and underground oxidation tests were carried out; the most successful results were obtained with a combined method of simultaneously oxidizing the nitric oxide and absorbing the oxidation products. An extraction plant was developed, based on the use of alkaline potassium permanganate solution impregnated on vermiculite; the performance of the trial filter showed the effectiveness of a single vermiculite bed, at least 2 ft thick, impregnated with a solution of 5% $NaCO_3$ and 5% $KMnO_4$ in oxidizing and absorbing the nitrous fumes; extraction is good up to 55 f.p.m. Because the bed loses a considerable portion of its absorbing power after extended use, the air should be by-passed during normal ventilation between blasts to reduce decomposition of the permanganate by the air. Despite the good extraction obtained, air from the filter should still be mixed with ventilating air to a dilution of not less than 5 to 1 before supplying the air to working places. The design of a suitable fume extraction plant is described.

14967

Hein, G. M. and R. B. Engdahl

A STUDY OF EFFLUENTS FROM DOMESTIC GAS-FIRED INCINERATORS. (American Gas Association, Inc., New York, Proj. DG-3M, 27p., June 1959. 24 refs.

Measurements were made of the effluents from nine domestic gas-fired incinerators, including two new prototype models, five new commercial units, and two older units. Standard test charges that typified wet domestic wastes and dry combustible materials, and two special refuse mixtures were burned. A free-standing chimney provided natural draft for the units. Sampling and analytical techniques were based on recognized methods. The concentrations in ppm in the flue gas and the emission rates in pounds per ton of refuse burned were determined for aldehydes, nitrogen oxides, organic acids, ammonia, and hydrocarbons. Grain loadings and emission rates were determined for particulate matter which included tarry organic materials. Odor and smoke density were also determined. Results demonstrated that significant reduction in emissions has been achieved through recent improvements in incinerator design. When wet domestic wastes are incinerated in new units, of up to 6-fold decreases in the rate of aldehyde emissions are achieved. Decrease in organic acids is 3-fold; decrease in saturated hydrocarbons is 8-fold. Although nitrogen oxides have increased 3-fold because of increased gas in the afterburner, their concentration is still lower compared to other combustion sources. Smoke, odor, and particulate matter emissions decreased to acceptable levels. Comparison of these emission rates with those from municipal incinerators shows that the new improved gas-fired domestic incinerators have lower particulate emissions, and, in general, equally low emissions of gaseous pollutants. Emissions from improved gas-fired units were in most cases lower than those from other incinerators and large gas- and oil-fired industrial heating units; they were much lower than those from automobile exhaust. The results of the study provide a basis for modification of the present restrictions in certain areas on the use of gas-fired domestic incinerators and for confirmation of their present acceptance in other areas.

14975

Lee, R. C. and D. B. Wimmer

EXHAUST EMISSION ABATEMENT BY FUEL VARIATIONS TO PRODUCE LEAN COMBUSTION. Preprint, Society of Automotive Engineers, Inc., New York, 20p., 1968. 15 refs. (Presented at the National Fuels and Lubricants Meeting, Tulsa, Okla., Oct. 29-31, 1968, Paper 680769.)

Differences in the power producing capacities and exhaust emission characteristics of various spark-ignition-engine fuels are frequently obscured by interactions involving the particular engine system used in the comparison. In an attempt to minimize this problem, gasoline, propane, methane, and a hydrogen-methane fuel gas were compared in a single cylinder engine under conditions that were optimum for each fuel. The resulting data, coupled with an estimated duty cycle representative of traffic service, permitted the development of internally comparable data on fuel consumption and exhaust emissions. Smog-inducing hydrocarbon emissions from the exhaust of a propane-fueled engine can be less than 13% of the minimum value obtainable with a gasoline fueled engine. Such emissions would be substantially eliminated with a well designed methane engine. Engines designed for propane and methane should have substantially no carbon monoxide in the exhaust, and only 40-50% as much nitric oxide as an engine designed for gasoline. In addition, lower specific fuel consumptions are possible with propane and methane. These benefits are primarily the result of better lean combustion performance with the two gaseous fuels. It is recognized that a fuel gas that might be steam-reformed from a liquid fuel would have even better lean mixture combustion behaviour and lower emissions than propane or methane. (Author abstract modified)

15087

Mucskai, Laszlo

THE PROCESS OF OXIDATION OF NITROGEN OXIDES IN THE PRESENCE OF EQUIMOLECULAR NO + NO2 ABSORPTION IN THE DILUTE TAIL GASES OF NITRIC-ACID PLANTS. (Nitrogenoxid oxidacioja hig nitrozus gazokban ekvimolekularis NO + NO2 folyamatos abszorpcioja mellett). Text in Hungarian. Magy. Kem. Folyoirat, 67(11):488-490, 1961. 1 ref.

A differential equation is derived that gives the incremental change in the partial pressure of nitrogen dioxide as a function of incremental change in nitric oxide concentration, oxygen concentration, the concentration of an inert gas, and the total pressure. The above conditions refer to the tail gas of a stack at a plant where nitric acid is manufactured from nitric oxide, sodium carbonate, and water; the tail gas (NO and NO2) concentration is 0.7-1.0 vol%. Subsequently, the equation is used to derive another differential equation rendering the time needed to accomplish an incremental change in NO concentration. This latter differential equation is considerably simplified so that it can be integrated. The resulting equation is presented in the form of a nomogram that can be used to calculate the volume of the absorber column or the oxygen concentration or the time needed to perform the reaction.

15100

Szepesy, Laszlo and Allesandro R. Giona

REMOVAL OF TRACE AMOUNTS OF NITRIC OXIDE BY ADSORPTION. (Kis mennyisegu nitrogen-monoxid eltavolitasa adszorpcioval). Text in Hungarian. Magy. Kem. Folyoirat, 71(9):399-403, Sept. 1965. 6 refs.

The presence of 0.1-0.8 ppm nitric oxide during the nitrogen washing of synthesized ammonia might result in an unexpected and powerful explosion. This study investigated the feasibility of NO removal by adsorption and selection of the most suitable adsorbent. For the test work, NO was produced by Emich's method, and NO analysis was performed by the Saltzman method using a

Lange Colorimeter. Three kinds of ion-exchange material (TRA 400, IMAC A 17, and IMAC C 12), two kinds of molecular sieves (5A and 13X), silica gel, and activated carbon were used as adsorbent materials; all materials were in the form of 30-40 mesh sieve fraction. Only the 5A molecular sieve and the activated carbon (Carlo Erba, Norit) gave appreciable breakthrough times. Test results of dynamic adsorption measurements are presented for the two chosen materials, giving the velocity of progression of the adsorption zone as a function of NO concentration and linear gas velocity, and the adsorption isothermal lines in the investigated concentration regime (0-13 and 24 ppm) for activated carbon.

15152

Schwanecke, Rudolf

WASTE GAS CLEANING THROUGH COMBUSTION OF NITROGEN OXIDES. (Abgasreinigung durch Verbrennen von Stickstoffoxyden). Text in German. Zentr. Arbeitsmed. Arbeitsschutz, 19(9):262-264, 1969. 3 refs.

Various methods for elimination of NO and NO2 from waste gases are reviewed. Absorption of the nitrogen oxides on silica gel has recently interested the nitric acid plants. Water vapor is used for desorption, and the recovered nitrogen oxides are returned to the nitric acid plant. If no recovery of the nitrogen oxides is desired, they can be removed from waste air by scrubbing with water or bases such as sodium hydroxide or ammonia water. The reaction follows the equation 3NO2 + H2O yields 2HNO3 + NO. As can be seen, only NO2 is removed. A patented process for dissociation of NO and NO2 in the reducing part of the flame is based on the reaction of carbon monoxide with NO2 and NO in a flame sustained in an atmosphere of low air. The reaction follows the equation 2NO + 2CO yields N2 + 2CO2. It has also been discovered that the nitrogen oxides dissociate in an atmosphere of 20% or more excess air. The process depends on the thorough mixing of the gases with the flame, as accomplished by atomization. In a chemical plant, NO and NO2 are eliminated by a combination of scrubbing and combustion. Nitric oxide escapes from the scrubber at a rate of up to 30 cu m/hr with a temperature of 30 C. It is mixed with air and atomized with the fuel oil in a muffle furnace; it serves as combustion air and as an atomizing agent for the fuel oil. About 3 to 5 ppm of NO and NO2 were measured in the waste gas of the furnace.

15270

Schmidt, Karl-Heniz

METHOD FOR REMOVING NITROGEN OXIDES FROM GASES THROUGH CATALYTIC REDUCTION OF THESE SUBSTANCES TO NITROGEN. (Verfahren zur Entfernung von Stickoxyden aus Gasen durch katalytische Reduktion derselben zu Stickstoff). Text in German. Hamburg Gaswerke, G.m.b.H., Hamburg) W. German Pat. 1,259,298. 2p., Jan. 25, 1968. 1 ref. (Appl. Aug. 29, 1964, 2 claims).

A method for removing nitrogen oxides from waste gases, flue gases, etc. involves catalytic reduction of these oxides to nitrogen at high temperatures in the presence of ammonia or compounds which liberate ammonia. Appropriate catalysts are oxides of the sixth to eighth subgroup of the periodic table of elements. Because these catalysts are resistant to sulfur, sulfur-containing gases, primarily flue gases, can be freed of their nitrogen oxides. Chromium and/or iron oxides are particularly effective catalysts. The reaction follows the equation $NO_2 + NO + 2NH_3$ yields $2N_2 + 3H_2O$. The reaction temperature can range from 150 to 300 C; about 250 C is preferred for dry gas and above 300 C for very moist gas. The advantages of this method are that (1) any concentration of NO and NO_2 is removed completely, even when sulfur is present, (2) no scrubbing process is necessary, (3) no by-product accumulates, and (4) the nitrogen oxides are converted in oxidizing atmosphere. Two practical examples are given. In the first case 250 kg catalyst were used per 300 cu m flue gas/hour. The dirty gas had a NO content of 120 ml/cu m and a NO_2 content of 15 ml/cu m. After catalytic reduction the nitrogen oxides concentrations were less than 0.01 ml/cu m. In the second case the gas contained 3000 ppm which were reduced to less than 0.1 ppm.

15271

Andersen, Holger C.

CLEANING OF INDUSTRIAL GASES WITH PRECIOUS METAL CATALYSTS. (Industrielle Gasreinigung mit Edelmetallkatalysatoren). Text in German. Dechema Monograph., 40(616-641):325-33, 1962. 28 refs.

The applications of platinum metals as catalysts for removing acetylene from olefins, cleaning coke-oven gas, and treating residual gases from the nitric acid production are reviewed. Of the family, platinum palladium is particularly suited for the hydration of acetylene so that only a few ppm remain. Recent laboratory tests indicate that at gas throughputs of up to 4500 standard cu m/hr/cu m catalyst, the addition of hydrogen can be reduced to a mole ratio between hydrogen and acetylene of 2. In the case of coke-oven gases, acetylene, nitrogen oxides, carbon oxysulfide, and diolefins are converted into harmless, easily removable compounds by palladium and ruthenium catalysts. Catalytic treatment of residual gases from nitric acid production has three goals: the removal of noxious components, recovery of the nitrogen in pure form for re-use at the ammonia synthesis, and production of heat. Recent laboratory tests show that the process can reduce the nitric oxide content of waste gases to 9 ppm.

15321

Eberan-Eberhorst, P.

FORWARD-LOOKING EXHAUST GAS RESEARCH FOR THE AUTOMOTIVE PETROL ENGINE. (Abgasforschung zukunftsweisend fuer den Fahrzeug-Otto-motor). Text in German. Motortech. Z. (Stuttgart), 30(9):315-323, Sept. 1969. 18 refs.

The influence of engine operation modification on the emission of such exhaust gas components as CO, hydrocarbons and nitrogen oxides is discussed. The use of an evaporator helps reduce carbon monoxide emission to the lowest possible concentration. A spinning motion in the air intake pipe also reduces the CO content. The type of carburetion has almost no effect on the CO or hydrocarbon emission. Study of the influence of temperature cooling agent on hydrocarbon emission showed that emission could be considerably reduced by raising the temperature of the agent. When the engine acts as a brake, hydrocarbon emissions jump to high concentrations due to misfiring. Spiral-like intake pipes or vortex-imparting installations in the intake system, tangential inlets or deflector valves have a considerable influence on hydrocarbon emission, which is decreased because the wall layer is completely burned due to the higher turbulence. This however, costs power. Compression of the intake air and spark timing also reduce these emissions. With a commonly used idling mixture containing 3% CO, the hydrocarbon emissions of a 1-liter four cylinder engine were reduced from 1720 ppm at 30 degree ignition advance to 180 ppm at 18 degree ignition delay. The emission of nitrogen oxides can be reduced by exhaust gas return to the fresh air which reduces the caloric value of the fuel/air mixture and by water injection into the intake pipe. Tests with the latter method showed that nitrogen oxide emissions could be reduced from 2000 ppm to 583 ppm. At lamda equal to one, a 20% addition of exhaust gas has the same effect as water injection at a water to fuel ratio of 1:2.

15322

Teske, Wolfgang

AIR POLLUTION CONTROL IN THE CHEMICAL INDUSTRY. (Luftreinhaltung in der chemischen Industrie). Text in German. Zentr. Arbeitsmed. Arbeitsschutz, 19(10):289-294, 1969. 11 refs.

Emissions developing from chemical production processes can be reduced either by modification of the process itself or by cleaning the stack gas. As an example of the first approach, the so-called double contact process is described. Sulfur dioxide from pyrite roasting is converted by catalytic oxidation with atmospheric oxygen to SO3. By addition of water, the latter is converted into sulfuric acid. The reaction is not complete; in the first stage of the process, 90% of the SO2 is converted to SO3, which is removed from the reaction gas mixture by absorption. The remaining 10% SO2 is converted to SO3 in the second stage. The residual SO2 concentration in the cleaned gas lies between 0.5 and 0.7 g/std cu m. The emission of NO and NO2 can be reduced by the use of higher pressures either during combustion or prior to absorption. The dust emissions from acetylene production can be reduced through the construction of a completely closed furnace from which no waste gas can escape without having first been cleaned. For cleaning of waste gases, there are several wet and dry methods. Hydrogen sulfide and carbon disulfide from the manufacture of synthetics are removed from the waste gas by adsorption on two layers of activated charcoal. Silicon tetrafluoride and hydrogen fluoride can be removed by venturi scrubbers, by Doyle scrubbers, where the gas is accelerated in an annular nozzle so that it hits the scrubbing liquid at high speed, by cyclone scrubbers, or by spray chambers.

15361

Ryason, Porter Raymond

PROCEDURE FOR ELIMINATION OF NOXIOUS CONSTITUENTS OF EXHAUST OR FLUE GASES. (Procede d'elimination des constituants nocifs des gaz d'echappement ou de cheminees). Text in French. (Chevron Research Co., Calif.) French Pat. 1,523,685. 5p., May 3, 1968. 1 ref. (Appl. May 19, 1967, 6 claims).

The invention concerns a procedure for elimination, at elevated temperatures, of SO_2 and nitrogen oxides (NOx) present in waste gases containing carbon monoxide in the ratio of at least 0.75, and more commonly 0.8 to 2, molecules of CO for every oxygen atom present in SO_2 and NOx. These gases are brought into contact for at least 0.1, and preferably about 0.2 to 0.5 sec at a temperature of at least 400, and preferably about 540 to 650 C, with a catalyst consisting of Cu, Ag, Ni, Mo, Pd, or Co cations adsorbed on an alumina agglomerate in amounts of about 0.2 to 2.0 weight % of the alumina. To convert the metal cation to the elemental state, the dried catalyst may be heated to about 480 to 650 C and maintained in a hydrogen atmosphere at that temperature for 0.5 to 2.0 hrs. The catalyzed reactions: SO_2 + 2CO yields 1/2 S_2 + $2CO_2$ and 2NOx + 2x(CO) yields N_2 + 2x(CO_2) are shown to proceed under the above conditions very nearly to completion.

15418

HOT GAS ENGINE REVIVAL. Design Components Eng., no. 2:10-13, Jan. 15, 1969.

A description of the hot gas engine used to decrease air pollution by diesel fumes is presented as developed by the Philips Research Laboratories at Eindhoven in Holland. All hot gas engines depend on compressing a gas at high temperature and expanding it to a low temperature, allowing the gas to do work on a piston. Heat is conserved within the engine by incorporating a heat exchanger between the permanently hot chamber and the permanently cold chamber. The regenerator receives heat from the media during expansion and returns it to the media during recompression, when the gas is again pushed back into the hot chamber. Most of the multi-cylinder engines are based on work carried out on single-cylinder units. The invention of the rhombic drive enabled the use of the out-of-phase layout and obviated the need for the pressurized crankcase. It consists of a geometric shape enclosed by the piston rod yoke and displacer rod yoke, and their associated connecting rods at any position during the engine cycle. The working gas is maintained at high pressure by an ancilliary pump which serves to vary the mean effective pressure within the cylinder and the power developed by the engine. A cylinder burner air preheater shrouds the nest of heater tubes during engine operation. The 'roll-sock' seal is used to seal the piston rod and prevent oil from entering the cylinder from the crankcase. Analyses carried out on the burner exhaust gases revealed the following: 1-2 ppm of unburnt hydrocarbons, 0.007-0.030% carbon monoxide, and 100-200 ppm nitrogen oxides.

15513

Jackson, Marvin W.

EXHAUST HYDROCARBON AND NITROGEN OXIDE CONCENTRATIONS WITH AN ETHYL ALCOHOL-GASOLINE FUEL. Preprint, Society of Automotive Engineers, Inc., New York, 33p., 1964. 29 refs. (Presented at Society of Automotive Engineers Summer Meeting, Chicago, June 8-12, 1964.)

The exhaust hydrocarbon and nitrogen oxide concentrations of a single-cylinder engine operating on a 25% wt ethyl alcohol-75% gasoline fuel are compared to those of the same engine operating on gasoline. Comparisons at an air-fuel ratio below 15.3 indicate that adding ethyl alcohol to gasoline reduces exhaust hydrocarbon concentrations but increases nitrogen oxide concentrations. At an air-fuel ratio higher than 15.3 ethyl alcohol reduces both hydrocarbon and nitrogen oxide concentrations. However, tests at the same air-fuel ratio indicate that ethyl alcohol increases surge and, in some cases, results in a power loss. To overcome these performance problems, the ethyl alcohol-gasoline fuel must be operated at about the same percent theoretical air as gasoline and comparative tests at the same percent theoretical air show that the additive has little effect on exhaust hydrocarbon and nitrogen oxide concentrations. The fuel mixture offers no promise for reducing pollution by automobiles. (Author abstract modified)

15620

Ohya, Masaaki

NITROGEN OXIDES FROM STATIONARY COMBUSTION FURNACE. (Koteinenshosochi karano chissosankabutsu). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 5(8):448-456, Aug. 25, 1969. 10 refs.

Sources of nitrogen oxides in the atmosphere and existing methods of control are reviewed. Nitrogen oxides are monitored mainly by electrical conductivity measurements or photo-electric colorimetry. In urban areas, they are primarily produced by the combustion of heavy oil, gasoline, or coal. The automobile exhaust is the main source of ambient nitrogen oxides, which are produced by the oxidation of nitrogen in the combustion chamber air of the engine. Their amount is determined primarily by the fuel ratio. Nitrogen oxides emission from stationary combustion furnaces, on the other hand, are not very serious at present, but have growing importance. Nitrogen oxides are more difficult to control than sulfur oxides; control is effected either by a wet system using venturi scrubbers, or a dry system using adsorbents, such as an active carbon. Several ways are described for controlling combustion. It is emphsized that those methods of combustion control do not apply to other harmful pollutants. A method of simultaneous removal of sulfur dioxide and nitrogen oxides is also described, together with the use of a catalyst for converting SO2 and nitrogen oxides into sulfuric and nitric acids respectively, and subsequently removing these acids by rinsing. Future development of control techniques is desired.

15765

Newman, Daniel J.

ELIMINATION OF NITROGEN OXIDES FROM GAS STREAMS. (Chemical Construction Corp., New York) U. S. Pat. 3,467,492. 6p., Sept. 16, 1969. 2 refs. (Appl. Nov. 6, 1964, 13 claims).

Conventional processes for eliminating nitrogen oxides from waste gas streams, such as tail gases from nitric oxide production, involve reacting methane with waste gases in one catalytic step, after which the waste gas is passed through a waste heat boiler and/or a gas turbine; or in two catalytic beds with intermediate cooling. The former method presents difficulties in design and operation; the second requires an intermediate exchanger or boiler, as well as ancillary control devices. In the present invention, nitrogen oxides are eliminated by a sequence involving two or more catalyst beds. The waste gas stream is divided into at least two portions; one portion is heated to 900 F and mixed with a proportion of methane less than the stoichiometric requirement for complete reaction with the oxygen and nitrogen oxides contained in the first portion. The gas mixture is then passed through the first bed where the stream temperature is raised to 1000-1400 F. Because the reaction with methane is not complete, the catalyst bed is not subjected to overheating and deterioration. The reacted gas mixture from the first bed is then quench-cooled to 900 F by the addition of a second portion of methane and cold waste gas. If only two beds are used, sufficient methane is added between beds to react with all the nitrogen oxides, and a final reacted stream free of nitrogen oxides is produced from the second bed. Advantages of the process are the substantial savings resulting from the elimination of the intermediate exchanger and reduction of the six of the heater required to preheat gases. In addition, improved operation is provided because the valves controlling the flow of waste gas and intermediate mixtures can be operated at low temperature.

15916

Plekhotkin, V. F., A. P. Kitts, and S. S. Gavlovskaya

DYANMICS OF SORPTION OF NITROGEN OXIDES BY AV-17 AND EDE-10P ANION EXCHANGE RESINS. J. Appl. Chem. USSR (English translation from Russian of: Zh. Prikl. Khim.), 42(7):1410-1413, July 1969. 8 refs.

Ion exchange resins are being used increasingly in the sorption of corrosive gases, but the dynamics of sorption by ion exchangers are relatively unknown. An investigation of the dynamics of sorption of nitrogen oxides by AV-17 and EDE-10P anion exchange resins showed that swollen EDE-10P resins have the longest time of protective action. Sorption by an EDE-10P resin is most effective at low linear gas velocities and at concentrations of nitrogen oxides not exceeding 4/mg 1. These are the concentrations present in waste gases from nitric acid production processes in which gases are passed through alkaline absorbers before being discharged to the atmosphere. A study of the feasability of installing anion exchanger filters after the absorbers could help solve the problem of complete removal of nitrogen oxides from industrial waste gases.

EFFECTS—HUMAN HEALTH

00033

H. E. Swann, Jr., D. Brunol, O. J. Balchum

PULMONARY RESISTANCE MEASUREMENT OF GUINEA PIGS. Arch. Environ. Health, 10(1):24-32, Jan. 1965. (Presented at the 47th Meeting, Federation of American Societies for Experimental Biology, Atlantic City, N.J., Apr. 1963.)

A method for measuring total respiratory flow resistance (thorax, lungs, and airways) in guinea pigs was modified for use in a long-term, day-to-day exposure of guinea pigs to the ambient air pollution of the Los Angeles basin. The principle of the method involves the use of an imposed pressure or volume change, sine wave in form and at a frequency such that the mechanical reactance is zero. At this point, the mechanical impedance is purely flow resistive, and flow resistance (R) may be expressed as a ratio of pressure (P) and flow (V) amplitude, $R=P/V$. The method is sensitive enough to measure acute changes in guinea pigs exposed to 5 ppm of SO_2 or 5 ppm of NO_2. Responses varied from animal to animal and for the same animal with repeated exposure. The response to 5 ppm SO_2 was much greater than to the 5 ppm NO_2. This may be due to different action of the two within the animal. The SO_2 may cause constriction of the airways either by direct contact with the airways or by reflex action or both; whereas, the NO_2 may only act by direct contact on the airways or the membranes of the gas exchange area. The speedy return to normal after the SO_2 is stopped would tend to favor the reflex action. Inspiratory resistances decreased faster than expiratory resistances during the recovery period. This indicates constriction of the airways after SO_2 exposure.##

00084

G.J. Doyle, N. Endow, J.L. Jones

SULFUR DIOXIDE ROLE IN EYE IRRITATION. Arch. Environ. Health, Vol. 3:657-667, Dec. 1961.

An eye-irritation panel was exposed to steady-state reaction mixtures generated in a 520 cu. ft. irradiated stirred-flow reaction chamber. The reactants for one set of exposures were usually 0.2 to 2.0 ppm by colume of olefins and NO_2 in purified air. Reaction residence times ranged from 1 to 2 hrs. SO_2 was used as an additional reactant (at a concentration of about 0.1 ppm) in a comparable set of experiments. The reacting mixtures were evaluated for relative eye-irritating ability, with and without SO_2. Aerosols derived from the co-photo-oxidation of SO_2 and from SO_2 itself probably have little effect on the eye-irritating ability of irradiated reaction mixtures. The net effect of the addition of SO_2 to the olefin reaction mixtures is a slight decrease in eye irritation accompanied by the appearance of an aerosol. Trace concentrations of branched internal olefins, specifically 2-methyl-2-butene, and of a cyclic olefin, cyclohexene, van produce significant amounts of irritants other than formaldehyde and acrolein. While no conclusions on the identity of these irritants can be drawn from the data, it is speculated that they may be compounds of the PAN type and/or reactive or unstable reaction intermediates. The use of dynamic (stirred-flow) conditions considerably enhances the sensitivity of subjects to the irritants. Indications are that small changes in the flow field about a subject's eyes may have large effects on response to the irritants in the flowing air. Adding isobutane, a branched-chain paraffin having a tertiary hydrogen atom, to a photooxidizing isobutylene-NO2 mixture produced no significant effect, either on the course of the reaction or on the eye irritation. This finding held true both with and without SO2. A small decrease in eye irritation was experimentally observed, but there are not sufficient data to demonstrate that this effect is statistically significant. The rate of response to an eye irritant is a function of the chemical nature of the irritant or irritants. Ethylene and proylene, olefins important in auto exhaust, can produce significant eye irritation at realistic atmospheric concentrations.##

00165

M. Kleinfeld

ACUTE PULMONARY EDEMA OF CHEMICAL ORIGIN. Ind. Hyg. Rev. 7, (2) 1-10, Dec. 1965. (Reprinted from the Arch. Environ. Health 10, 942-6, June 1965.)

Six instances of pulmonary edema due to toxic exposure to ozone, nitrogen dioxide, cadmium oxide fumes, dimethyl sulfate, hydrogen sulfide and hydrogen fluoride are presented. The problems of diagnosis are discussed. In view of the unusual severity of these cases, the following points were stressed: (1) the need of the physician to be aware of the possible industrial origin in all instances where the cause of the pulmonary edema is obscure; (2) the importance of careful observation of the patient known to be exposed to an agent capable of producing a delayed pulmonary edema, even in the initial absence of any symptoms; (3) since certain of these agents, such as ozone and hydrogen sulfide, can act on the central nervous system to produce respiratory depression, it is contraindicated to administer morphine in these instances. Digitalis likewise has no place in the management of pulmonary edema caused by exposure to the chemicals mentioned. The effective treatment is primarily preventive, which calls for proper ventilation of the work environment and an adequate knowledge of the operational processes and procedures. The immediate treatment should include the following: (1) oxygen under controlled positive pressure to the inspiratory cycle, (2) nebulized bronchial dilators for the bronchial spasm, (3) steroids in the more severe cases, (4) broad-spectrum antibictics for superimposed bacterial infection, (5) nebulized nonirritant bronchial detergents for increasing mucous secretion, and (6) tracheostomy as indicated. (Author)##

00180

J. A. Sirs

THE USE OF CARBON MONOXIDE TO PREVENT SICKLE-CELL FORMATION. Lancet 1, 971-2, May 4, 1963.

The study was undertaken to establish whether ligands such as carbon monoxide and nitric oxide would reverse sickling, and to explore the possibility of reducing the degree of sickle-cell formation in vivo by supplementing oxygen with a low concentration of CO. Both in vitro and in vivo studies are discussed. In order to study the effects of CO, a mask was placed over a patient suffering from the sickle cell disease and during the period of controlled breathing, he was given a total of 25 ml of CO, corresponding to an estimated 4% saturation of COHb in the red cells. Blood sampling revealed an initial concentration of 10.2% sickle cells with a standard deviation of plus or minus 2.5% and only 3.9 plus or minus 1.5% sickle cells after the addition of CO (P less than 0.05). A more detailed examination of this approach is suggested.##

00189

T. Dalhamn and J. Sjoholm

STUDIES ON SO2, NO2, AND NH3: EFFECT ON CILIARY ACTIVITY IN RABBIT TRACHEA OF SINGLE IN VITRO EXPOSURE AND RESORPTION IN RABBIT NASAL CAVITY. Acta Physiol. Scand. (Stockholm) 58, 287-91, 1963.

One of the factors which determine the toxicity of pulmonary irritant gases, etc., presumably is their action on the ciliated epithelium of the respiratory tract. The degree to which such gases are resorbed in the mucous layer of the respiratory passages must also be taken into account when hygienic limits and allied questions are discussed. The present paper illustrates these two factors, viz., ciliostatic action and resorption, by experiments with three common respiratory irritant gases--sulphur dioxide, nitrogen dioxide and ammonia. As regards concentration required to arrest tracheal ciliary activity in vitro, the three gases varied considerably. The degree of resorption in the upper respiratory tract also showed wide variations. It seems probable that a gas which even in low concentration rapidly impairs ciliary activity and which is resorbed to a relatively slight degree can penetrate deeper into the bronchial tree and thus, on the stated assumptions, be more toxic than gases with the reverse characteristics. (Author)##

00308

H. Heimann

EFFECTS OF AIR POLLUTION ON HUMAN HEALTH. World Health Organization Monograph Ser., No. 46 (Air Pollution), p. 159-220, 1961.

As one chapter of a WHO Monograph on "Air Pollution," this paper covers the state of knowledge and world trends in research on the effects of such pollution on human health. The acute air pollution episodes in the Meuse Valley, Doncra, London, and Poza Rica are reviewed. Data, causes, and effects for each episode are discussed. The symptoms of illness and organic and systemic effects resulting from major pollutants such as carbon monocide, sulfur and nitrogen oxides, ozone, beryllium, fluorides, aeroallergens, carcinogens and pesticides are described. Further research to demonstrate that specific pollutants or combinations thereof can cause ill health is urged in order to obtain data to balance health effects against economic aspects for the purpose of clearing the air. The maximum allowable concentrations for community air, published by the Russians, are considered inadequate to solve the air pollution problem. However, studies already made of the effect of low-level concentrations have been used as a base, despite controversy, to reduce pollution in many locations.##

00312

W. S. Spicer, Jr., P. B. Storey, W. K. C. Morgan,
H. D. Kerr, N. E. Standiford

VARIATION IN RESPIRATORY FUNCTION IN SELECTED PATIENTS AND ITS RELATION TO AIR POLLUTION. Am. Rev. Respirat. Diseases 8, 705-12, Nov. 1962. (Presented at the Meeting of the American Thorac Society, Cincinnati, Ohio May 22-24, 1961 and at the Air Pollution Medical Research Conference, Los Angeles, Calif. Dec. 4, 1961.)

Authors present data from samples collected from a group of 150 patients with chronic obstructive airway disease who reside in a 40 by 20 block area in the city of Baltimore. The results obtained are as follows: (1) The patients become better and worse together. This is in the presence of possible non homogeneity of the group and strongly suggests to authors that they are influenced by something common to their common environment; and (2) It would appear that the patients physiologic changes are related to environmental factors. However, at the present the authors are unable to accept a simple cause and effect relationship with any one pollutant. Rather, this appears to be a complex problem involving combinations of factors with subtle variations around the theme of environmental changes. (Author)##

00334

H. V. Thomas, P. Wright, and P. K. Mueller

RESPONSE OF RAT LUNG MAST CELLS TO NITROGEN DIOXIDE INHALATION. Preprint. J. Air Pollution Control Assoc. 17, (1) 33-5, Jan. 1967. (Presented at the 59 th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-18.)

Irritant gases in concentrations that occur in polluted atmospheres might play a role in the degranulation and histamine release processes of mast cells in lung tissue. To test this hypothesis, young rats weighing 140 to 150 gms were exposed to one ppm nitrogen for one hour. One group was killed immediately, and another group 24 to 27 hrs. after exposure. A third was exposed to 0.5 ppm nitrogen dioxide for four hours and killed immediately. Animals serving as controls were placed for an hour into the exposure chamber ventilated with ambient air. Standard histological preparations were made after Carnoy's fixative and subsequent staining with toluidine blue. The mast cells of the control animals appeared relatively intact with no evidence of disorientation. The cells of the animals exposed to NO2 and sacrificed immediately revealed rupture and loss of cytoplasmic granules with some disorientation. These changes were observed in the pleura, bronchi and surrounding tissue with the effects more marked in the mediastinum. The mast cells of exposed animals sacrificed about 24 to 27 hrs after discontinuing the exposure showed in some cases a combination of ruptured and intact cells with a predominance of the latter, and in other cases could not be differentiated from the controls. These findings indicate that 24 hrs or more are required to reverse the acute effects of NO2 inhalation. The toxicological implications will be discussed. The release of granular substances in the lung tissue when NO2 is inhaled signifies the onset of an acute inflammation. (Author)##

00338

J. T. Davidson, G. A. Lillington, G. Haydon, and K. Wasserman

THE ANATOMICAL AND PHYSIOLOGICAL CHANGES IN THE LUNGS OF RABBITS EXPOSED TO NO2. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-6.)

The objective of this study was to determine the effect of continuous exposure to NO2 on pulmonary function and to seek physiological elucidation of the nature of pulmonary lesions. Pulmonary function studies under general anaesthesia were carried out on 20 normal rabbits aged between 6 months and 1 year (control) and on 13 experimental animals of the same age after 3 to 4 months' exposure to NO2. In addition, some of the experimental animals were restudied 4 days to one month after the termination of the exposure period. The overall picture which emerged from respiratory function tests on rabbits exposed to 8 to 12 parts/million NO2 continuously for 3 to 4 months, was one of severe airway obstruction with marked hyperinflation and arterial oxygen desaturation. The hypoxemia was not associated with hypercapnia and most likely was the result of abnormal ventilation-perfusion ratios associated with nonuniform airway obstruction rather than hypoventilation. Although the static pulmonary compliance recorded in the experimental animals was not statistically different from that of the controls, it tended to be reduced. A clue to the nature of the lesion associated with the physiological derangements described here, can be obtained from the results of the recovery experiments. The major and rapid reversal in airway obstruction, oxygen desaturation, hyperinflation and decreased pulmonary compliance points to an inflammatory lesion or plugging of the smaller airways by mucus rather than to the destructive process which persists after the animals are removed from the NO2.##

00339

G. C. Buell, Y. Tokiwa, and P. K. Mueller

LUNG COLLAGEN AND ELASTIN DENATURATION IN VIVO FOLLOWING INHALATION OF NITROGEN DIOXIDE. Preprint. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-7.)

The conversion of excised rabbit lungs to a lipid-free powder immediately following inhalation of nitrogen dioxide is described. From this material, the structural proteins collagen and elastin were isolated by a combination of solvent extraction and enzymatic hydrolysis. From the spectra obtained by differential UV spectrophotometry, evidence is presented to show that each of the proteins underwent a change in conformation following the inhalation of one ppm NO2 for one hour. This change appears to be reversible. The relationship of respiratory function to in vivo alteration of molecular structure is discussed. (Author's abstract)##

00428

C. H. Hine, R. D. Cavalli, and R. R. Wright

RESEARCH ON THERAPY OF PULMONARY EDEMA ASSOCIATED WITH OXIDIZERS. Hine Labs., Inc., San Francisco, Calif. (Rept. No. AMRL-TR-65-178). Nov. 1965. 40 pp.
CFSTI, DDC: AD 628 593

An evaluation was made of candidate therapeutic agents for the treatment of acute pulmonary edema resulting from nitrogen dioxide exposure. Treatments consisting of hypdrbaric air and oxygen; tracheal toilet; ethyl, isopropyl, and octyl alcohol vapors; hydralazine; bethanechol; physostigmine; and isoproterenol aerosols produced no change in the mortality, survival time, or lung/body weight ratios of rats suffering from NO2-induced acute pulmonary edema. Rutin in large doses caused a decrease in mortality and an increase in survival time of exposed rats. Intravenous infusion of isoproterenol caused a decrease in mortality in rabbits exposed to NO2. The effectiveness of hyperbaric oxygen, hydrocortisone, rutin and bethanechol against moderate exposure to NO2 was determined by solvent uptake measurements with rats. Oxygen administered 4 hours after exposure increased solvent uptake. There were no significant effects due to the other compounds. (Author Abstract)##

00429

A. A. Thomas

LOW AMBIENT PRESSURE ENVIRONMENTS AND TOXICITY. Arch. Environ. Health Vol. 11:316-322, Sept. 1965.
CFSTI, DDC: AD 628 566

A unique inhalation exposure facility has been built to study the effects of low atmospheric pressure and oxygen-rich atmospheres on the characteristics of truly uninterrupted, long-term, continuous exposure to toxic chemicals. The first experiments reported herein include exposure of a large number of mice, rats, dogs, and monkeys to graded doses of ozone, nitrogen tetroxide, and carbon tetrachloride in a 100% oxygen atmosphere at 5 psi pressure for 2 weeks duration. Further, a 90-day exposure to 5 psi 100% oxygen of a similar animal complement is also reported. Biochemical and enzymatic changes related to toxic exposure are discussed together with the future experiments planned for this facility.##

00473

F.G. Hueter, G.L. Contner, K.A. Busch, R.G. Hinners

BIOLOGICAL EFFECTS OF ATMOSPHERES CONTAMINATED BY AUTO EXHAUST. Arch. Environ. Health 12, 553-60, May 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965.)

This report represents a status summary of the biological results obtained from the chronic exposures of experimental animals to various concentrations of irradiated and nonirradiated auto exhaust for periods of 6 weeks to 23 months. The chronic exposure of experimental animals to various concentrations of irradiated and nonirradiated auto exhaust-air mixtures resulted in significant biological effects indicating the following: irradiated auto exhaust (1) increases the susceptibility to pulmonary infection and chronic disease during the latter half of the animal's lifetime, and (2) markedly decreases mouse fertility and decreases the survival rate of infant mice; both raw and irradiated auto exhaust cause a stress and adaptation response in mice as measured via spontaneous activity, increase bone lead concentrations, and increase the amount of nonfunctional or abnormal lung tissue. No experimental atmospheric effects were observed concerning: mortality; histopathology; growth-bodyweight; immunology; hematology restricted to erythrocyte count, erythrocyte cell size distribution, hematocrit or hemoglobin concentration; blood O2 and CO2 values; oxygen consumption; or pulmonary function in relation to permanent impairment. Further studies are indicated to elucidate more fully the affected biologic parameters.##

00499

M. Corn and G. G. Burton

THE CONCENTRATION AND DISTRIBUTION OF IRRITANTS IN POLLUTED ATMOSPHERES. Preprint. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., Mar. 2-4, 1966.)

Consideration of maximum recorded U.S. concentrations of single gaseous or particulate pollutants indicated that alterations in airway resistance and lung compliance in animals or man have not been demonstrated after inhalation of single irritants at these concentrations. At this time it is difficult to speculate on the acute or chronic changes produced, if any, in these functional measurements by inhalation of complex mixtures of low concentrations of individual irritants. Certainly, eye irritation demonstrates that effects which are not predictable on the basis of the action of a single irritant are produced by mixtures of irritants. Airborne particulate irritants should be assessed with respect to aerodynamic particle size, because (1) chemical composition of particles has been demonstrated to vary with size and (2) only certain particle sizes present in polluted atmospheres are capable of reaching receptors after inhalation by man. Among the defects of present routine sampling methodologies are: (1) size distribution of sampled particles is not known; (2) the optimum density of sampling stations for the procurement of reliable results is unknown, and (3) the irritant potential of pollutant mixtures is not taken into account when single pollutants are evaluated. (Author summary)##

00501

E. J. Fairchild, II

TOLERANCE MECHANISMS AS BIOLOGIC DETERMINANTS OF LUNG RESPONSES TO INJURIOUS AGENTS. Arch. Environ. Health, 14(1):111-126, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., Mar. 2-4, 1966.)

This presentation has attempted to focus on the conditions and characteristics of tolerance developmentas a biologic factor relative to the response of the lung to injurious agents. Besides insight to the possible mechanism accounting for tolerance, attempt was made to point out practical implications of the tolerane phenomenon. Thus, the protective mechanism of tolerance is primarily directed atainst the acute and subacute effects of deep-lung irritants. The realization of the degree of tolerance and cross-tolerance which develops in animals, duringintermittent exposures of varied concentrations, brings up the fate of lung tissue, as well as the whole organism, which is protected against the edema producing properties of irritants. Besides edemagenesis, irritants provoke another lung reaction, i.e., proliferation of cellular elements in the deeper reccesses, which in some instances may prove fatal. The alterations induced by more subtle, chronic exposure which should be of concern since tolerance does not appear to inhibit these; if anything, the tolerance mechanism may permit provocation of conditions such as emphysema, fibrosis, and may permit provocation of conditions such as emphysema, fibrosis, and other aging phenomena. Studies have shown that chronic exposures of 0.1-0.2 ppm of produced myocardial tissue damage in rabbits and mice, as well as significant increase of first and second generation neonatal mortality. In animals, at least, repeat exposures to low concentrations of deep-lung irritant such as are not innocuous even though tolerance mechanisms are operative. (Author's summary)##

00508

P.E. Morrow

ADAPTATIONS OF THE RESPIRATORY TRACT TO AIR POLLUTANTS. Arch. Environ. Health 14(1):127-136, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., Mar. 2-4, 1966.)

This paper briefly describes the criteria for establishing certain biological responses as adaptations. The adaptations of the respiratory tract to air pollutants discussed in this paper are: increased endocytosis to the adaptagents, insoluble dusts; increased mucous secretion to the adaptagents, respiratory irritants; and the development of tolerance to the actue edema produced by the adaptagents, oxidants. Some other adaptates of less significance are also discussed. For each of the principal adaptations, an attempt was made to provide some mechanistic basis. An increase in long term research on low dose effects and an epidemiologic approach to the procurement and assessment of normal physiological parameters are needed. (Author's Abstract)##

00509

Q. N. Myrvik D.G. Evans

METABOLIC AND IMMUNOLOGIC ACTIVITIES OF ALVEOLAR MACROPHAGES. Arch. Environ. Health 14(1):92-96, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., Mar. 2-4, 1966.)

Normal alveolar macrophages develop a marked increase in metabolic activity of the gluconic shunt pathway following phagocytosis of heat-killed BCG. A rise in lysozyme and acid phosphatase also was observed about 5 to 7 days after intratracheal injection of BCG. A similar lag in the occurrence of a bactericidal factor against Mycobacterium smegmatis was observed following intratracheal injection of living M. smegmatis. These observations suggest that alveolar macrophages respond adaptively to their phagocytic load and that metabolic stimulation may be a prerequisite to immunologic expression. Nitrogen dioxide was found to suppress metabolism of alveolar macrophages as well as their phagocytic function. It is proposed that certain pollutnats could impair the immunologic capacity of the respiratory tract leading to chronic low grade pulmonary infections. Allergic responses, as well as primary tissue damage caused by proliferating microorganisms, may contribute to the pathogensis of air pollution disease. (Author abstract)##

00511

R. E. Pattle P. Down

LUNG SURFACTANT AND ITS POSSIBLE REACTION TO AIR POLLUTION. Arch. Environ. Health 14(1):70-76, Jan. 1967. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., March 2-4, 1966.)

An outline is given of the knowledge of the alveolar surfactant, its function and the possible reaction of the surfactant with atmospheric pollution, of which there is no experimental evidence available. The difficulty of obtaining such evidence, with special reference to an imaginary investigation of the effect of nitrogen dioxide on the surfactant, is discussed in this paper.##

00519

W.S. Spicer, Jr.

EFFECTS OF AIR POLLUTION AND METEOROLOGIC FACTORS ON NORMAL SUBJECTS AND PATIENTS WITH RESPIRATORY DISEASE. Preprint. (Presented at the American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif., Mar. 2-4, 1966.)

Whether one subscribes to the thesis that major chronic obstructive lung diseases are the result of long-term repetitive exposures to a variety of environmental agents, frequently acting in combination, or allows the possibility of such diseases being initiated by a single inhalation experience with respiratory viral agents or toxic chemicals, it is generally accepted that all members of the population who are comparably exposed are not equally likely to acquire severe disease. This human-environmental multivariate interaction was investigated through the physiologic monitoring of small groups of normal subjects and diseased individuals. 2t was hoped that patterns of respiratory functional variations might become apparent which are common to groups of subjects; that the nature of these patterns might give an indication as to the identity, intensity, and duration of the stimuli and physiologic responses; and that this might lead to the physiologic grouping of individuals leading to detection of a segment of the population particularly susceptible to chronic obstructive respiratory disease. This paper is an attempt to summarize the major portion of this work to dat. Results suggest that acute and long term patterns of variation in respiratory function are present in normal subjects and in patients with chronic obstructive lung disease while they are in ambient, urban, inside and outside environments; that subjects within groups undergo similar variations in respiratory function; that these changes are not simply random, but, to a large extent, are the result of meteorologic and air pollutant stimuli. Correlations between temperature and long-term respiratory functional changes were found in normal subjects. Highly significant correlations between two hour levels of SO2 occurring approximately 38 hrs prior to subject testing and mean group airway resistance values were found in ambulatory patients and in normal subjects confined to a special hospital ward. The SO2 levels at which these occur are well within those commonly found in many communities.##

00622

A.P. Altshuller, D. Klosterman, P.W. Leach, and
J. F. Sigsby, Jr.

THE IRRADIATION OF SINGLE AND MULTI-COMPONENT HYDROCARBON - AND ALDEHYDE - NITRIC OXIDE MIXTURES IN AIR UNDER DYNAMIC AND STATIC FLOW CONDITIONS. Preprint. 1964.

An investigation has been made of the chemical, aerosol plant damage, and eye irritation effects of irradiating various single hydrocarbon - aldehyde or multi-component hydrocarbon - NO systems under dynamic flow conditions. The systems investigated included the following individual hydrocarbons which were irradiated in the presence of NO (and traces of NO2): ethylene, 1-butene, 1,3-butadiene, toluene, xylene, and 1,3,5-trimethylbenzene, n-hexane, 3-methylpentane, 2,4,4-trimethylpentane, and cyclohexane. Mixtures of hydrocarbons including ethylene and 1-butene; ethylene, 1-butene, and trans-2-butene; and ethylene, 1-butene, trans-2-butene, and mixed xylenes also were irradiated in the presence of nitrogen oxide in air. In addition the photooxidation of the formaldehyde - oxygen, propinaldehyde - oxygen, formaldehyde - NO and propionaldehyde - NO systems were investigated. In these dynamic irradiation experiments the 4 paraffinic hydrocarbon - NO systems produced neither oxidant nor plant damage. In all of these systems NO was only partially converted during irradiation and NO2 did not peak. When 0.5 ppm of ethylene, 0.5 ppm of an ethylene - butene-1 mixture, or 0.5 ppm of xylene was irradiated with 1 ppm of NO no net oxidant and no plant damage occurred. At ethylene or toluene concentrations between 3 and 6 ppm with 1 ppm of NO, irradiation produced oxidant but no plant damage of either the ozone or PAN type. Many of these mixtures did react somewhat with the disappearance of part of the hydrocarbon and the formation of significant yields of formaldehyde or aliphatic aldehydes. Propionaldehyde when irradiated in the presence of small traces of nitrogen oxides produced severge plant damage. (Author abstract)##

00637

S. D. Murphy, C. F. Ulrich, S. H. Frankowitz, and C. Xintaras

ALTERED FUNCTION IN ANIMALS INHALING LOW CONCNETRATIONS OF OZONE AND NITROGEN DIOXIDE. Am. Ind. Hyg. Assoc. J. Vol. 25:246-253, June 1964.

Quantitative measurements of respiratory function of guinea pigs were made before, during, and after exposure to low concentrations of ozone, and nitrogen dioxide. The earliest effects detected during exposure to either of the gases were increased respiratory frequency and decreased tidal volume. These effects were noted during 2-hour exposures to concentrations of ozone as low as 0.34 ppm or within 4 hours of exposure to NO2 at a concentration of 5.2 ppm. Previous exposure to ozone did not result in tolerance to the respiratory function changes produced during exposure to a 1.5-ppm concentration of the gas. Voluntary running activity of mice was depressed during exposure to concentrations of ozone between 0.2 and 0.7 ppm and to NO2 concentrations of 7.7 to 20.9 ppm. (Author abstract)##

00638

P. A. Kenline

OCTOBER 1963 NEW ORLEANS ASTHMA STUDY. Arch. Environ. Health Vol. 12:295-304, Mar. 1966.

This paper reports on aerometric activities carried out in New Orleans from Oct. 3 through Nov. 5, 1963. The objectives of these activities were to establish any difference in air quality between asthma outbreak days and other days, evaluate geographic and temporal variation in pollution characteristics, and evaluate various uncommon methods of measuring air pollution. (Author abstract)##

00639

M. B. Gardner

BIOLOGICAL EFFECTS OF URBAN AIR POLLUTION. III. LUNG TUMORS IN MICE. Arch. Environ. Health Vol. 12:305-313, Mar. 1966.

This paper reports the long-term effect of inhaling Los Angeles ambient air upon the incidence of lung adenomas in several inbred strains of mice. Despite the absence of histopathologic evidence for any specific acute effect related to ambient air pollution in the experimental mice colonies, the statistical evidence of this study indicates a strong likelihood that ambient Los Angeles atmosphere does possess a definite though slight activity in promoting pulmonary adenomatous tumors in aging inbred mice. These findings offer further evidence that some lung tumorigenic activity does exist in the indigenous respiratory environment.##

00658

F.L. Estes, C.H. Pan

RESPONSE OF ENZYME SYSTEMS TO PHOTOCHEMICAL REACTION PRODUCTS. Arch. Environ. Health Vol. 10(2):207-212, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

Exposure to photochemical reaction products inhibited the activity of glutamic dehydrogenase from Escherichia coli. With a glutamate substrate the inhibition increased at a rate comparable to the inhibition of the growth of the cells. Considerably less inhibition was observed for the reaction in the reverse direction. With increasing formaldehyde concentrations, the reaction of glutamic dehydrogenase from mammalian source was more rapidly inhibited in the reverse than in the forward direction. From the data to date, it appears that only at very low concentrations could formaldehyde produce the relationship of the reactions observed with the photochemical reaction products. There is no evidence, however, that such concentration would produce comparable magnitudes of inhibition with time. (Author summary)##

00660

R.D. Buckley O.J. Balchum

ACUTE AND CHRONIC EXPOSURES TO NITROGEN DIOXIDE. Arch. Environ. Health Vol. 10(2):220-223, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

This study was an attempt to measure some of the metabolic effects of the air pollutant NO2 on lung and other body tissues.

To relate changes in oxygen consumption and enzyme activities in organs to length of exposure it would be well to subject a series of animals to a single concentrtion of NO2 (15 ppm, for example) and study tissues from animals (exposed and control) during regular intervals after the initiation of the regimen. This would clarify the observations in oxygen consumption of liver homogenate. It would also be of value to express enzyme activity in terms of substrate utilization in order to obtain more information about the specific activity of the tissue homogenates.##

00665

D.E. Rounds F.F. Bils

EFFECTS OF AIR POLLUTANTS ON CELLS IN CULTURE. Arch. Environ. Health Vol. 10(2):251-259, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

From an analysis of oxygen consumption rates, all cell types tested in vitro showed a partial but reversible inhibition in oxidative activity during treatment with NaNO2. Morphological studies of living cells with phase contrast microscopy and of fixed material with the electron microscope revealed that the alveolar wall cell showed changes in the shape of the nucleus and the ultrastructure of the mitochondria during NO2 treatment. These changes may offer the opportunity to describe and quantitate the biological effects of NO2 and possibly, of other air pollutants. (Author summary)##

00668

O.J. Balchum, R.D. Buckley, R. Sherwin, M. Gardner

NITROGEN DIOXIDE INHALATION AND LUNG ANTIBODIES. Arch. Environ. Health Vol. 10(2):274-277, Feb. 1965. (Presented at the Seventh Annual Air Pollution Medical Research Conference, Los Angeles, Calif., Feb. 10-11, 1964.)

A circulating substance or lung tissue antibody has been found to appear in the serum of guinea pigs inhaling nitrogen dioxide in concentrations of 5 ppm and of 15 ppm. It can be detected in dilutions of serum greater than 1:100,000 by its property of agglutinating latex particles coated with normal lung proteins.##

00779

H.E. Swann, Jr., D. Brunol, L.G. Wayne, O.J. Balchum

BIOLOGICAL EFFECTS OF URBAN AIR POLLUTION. II. CHRONIC EXPOSURE OF GUINEA PIGS. Arch. b8environ. Health. Vol. 11:765-769, Dec. 1965.

Guinea pigs have been directly exposed to ambient Los Angeles air for two years. Monthly measurements of their total expiratory resistance were made plethysmographically, and compared with those of guinea pigs breathing air filtered through activated-charcoal.

Variations in resistance occurred from month to month, but no difference in resistance was noted between guinea pigs residing in ambient air and those living in filtered air. Total pulmonary resistance appeared to increase with aging. During the second year of their life span, the mortality of guinea pigs living in ambient air was slightly greater than of those living in filtered air, but this difference was not significent at the 5% level by the chi square test. (Author summary)##

00825

AIR POLLUTION AND HEALTH. Bull. N.Y. Acad. Med. 42, (7) 588-619, July 1966.

Acute episodes of mortality and morbidity furnish strong support for a casual relationship between air pollution and injurious effects. The following conclusions were established: (1) Air pollution in episodes of high levels is harmful and can be lethal. (2) Although chronic effects have not yet been demonstrated, it si reasonable to presume that since episodes brought acute sickness and death, exposure to lesser concentrations for prolonged periods will have effects. (3) Not all the injurious pollutants have been identified, nor have their adverse effects been definitely and specifically established. Recommendations are made based on the conclusions. (Author's summary)##

00852

H.E. Stokinger

OZONE TOXICOLOGY - A REVIEW OF RESEARCH AND INDUSTRIAL EXPERIENCE, 1954-1964. Arch. Environ. Health 10, 819-31, May 1965.

The rise of ozone as an important air pollutant and component of oxidant smog serves as the cause for this review of research and industrial experience in ozone toxicology for the period 1954-1964. After a brief introduction, the author discusses the material under the following subject headings: Effects on Man; Extra-pulmonary Effects on Man; Effects in Animals - Acute Toxocity; Factors Affecting Toxicity; Tolerance Development: Cross-Tolerance; Chronic Toxicity; Effects in Lower Organisms and Cell Structures; Interactions; and Mechanisms.##

00919

G. Freeman and G. B. Haydon

EMPHYSEMA AFTER LOW-LEVEL EXPOSURE TO NO2. Arch. Environ. Health, Vol. 8:125-8, Jan. 1964. (Presented at the Sixth Annual Air Pollution Medical Research Conference San Francisco, Calif., Jan. 28-29, 1963.)

Biological sequelae of long-term exposures to low concentrations of nitrogen dioxide have become of interest because oxides of nitrogen are a regular constituent of smog. Current studies have determined the maximum nitrogen dioxide concentration in air that does not cause death from acute pulmonary edema and allows rats to survive for several months. At this and at lower concentrations, long-term effects are being studied initially, with particular attention to the pulmonary pathology.##

00932

T. F. Huber, S. W. Joseph, E. Knoblock, P. L. Redfearn, and J. A. Karakawa

NEW ENVIRONMENTAL RESPIRATORY DISEASE (YOKOHAMA ASTHMA) (PRELIMINARY REPORT). Arch. Ind. Hyg. Occupational Med., Vol. 10:399-408, 1954. (Presented before the National Academy of Sciences-National Research Council, Division of Medical Sciences, Subcommittee on Atmospheric & Industrial Hygiene, 1954, and the Committee on Sanitary Engineering and Environment, 1954.)

The clinical features are presented of a new environmental respiratory disease occurring in certain areas of Japan during the winter months among the United States military personnel. From preliminary atmospheric data there appears to be a correlation between the incidence of this environmental respiratory disease entity, the concentration of air contaminants, and smog formations. Of the air contaminants investigated, only the ether-soluble aerosols and dust appear to have significant correlation with the incidence of this respiratory entity. Additional investigations will be required to corroborate the above suggested correlations. (Author summary)##

00933

M. R. Purvis and R. Ehrlich

EFFECT OF ATMOSPHERIC POLLUTANTS ON SUSCEPTIBILITY TO RESPIRATORY INFECTION. II. EFFECT OF NITROGEN DIOXIDE. J. Infect. Diseases, Vol. 113:72-76, Aug. 1963.

A 2-hour exposure of mice to as little as 3.5 ppm of nitrogen dioxide significantly increased their susceptibility to respiratory infection initiated by challenge with an aerosol of Klebsiella pneumoniae. This effect was observed up to 27 hours after exposure. Infected animals exposed to 25 ppm of nitrogen dioxide for 2 hours showed an increased mortality rate and decreased survival time. This effect was evident up to 72 hours after infection. Exposure to 2.5 ppm of nitrogen dioxide for 2 hours did not induce any changes in susceptibility to infection. (Author summary)##

00980

L.S. Jaffe

THE BIOLOGICAL EFFECTS OF PHOTOCHEMICAL AIR POLLUTANTS ON MAN AND ANIMALS. Am. J. Pub. Health, 57(8):1269-1277, Aug. 1967. (Presented at the Annual Meeting, American Public Health Association, San Francisco, Calif., Oct. 31 - Nov. 4, 1966.)

Common manifestations of atmospheric photochemical smog are eye irritation, respiratory distress, haze formation (reduction in visibility), peculiar odors, characteristic vegetation damage, and excessive cracking of rubber products as well as the presence of unusually high levels of oxidizing substances identified as photochemical oxidants. The photochemical oxidants are a major class of compounds found in photochemical smog. They consist of a complex mixture of atmospheric oxidizing substances whichvary in time and place and which are not completely defined chemically. They can be measured routinely in community atmospheres, however, and analyzed collectively for "total oxidant", the net oxidizing effect of all such substances in the atmosphere, thus serving as useful indices of effective levels of photochemical pollution. Ozone and perocyacyl nitrates (PAN compounds) have been identified as important oxidants found in photochemical smog. A review of the important adverse effects of atmospheric photochemical smog on man and animals expressed in terms of atmospheric "total oxidant" concentrations is presented based on published reports and some yet unpublished reports and research findings. Additionally, data based on laboratory exposures of man and animals to ozone and PAN compounds are reviewed. An understanding of the effects of these individual oxidants in pure form contributes substantially to our knowledge of the effects of the ambient photochemical "total oxidant" mixture. The photochemical oxidants, particularly ozone, are severe respiratory irritants which cause temporarily impaired lung function in man and animals in short exposures. In prolonged exposures, there is an increase in mortality of newborn animals as well as of animals exposed to respiratory infection. Recent studies indicate a decreased birthrate of laboratory animals in ptolonhrf rxpodures to synthetic photochemical smog. Additionally, late studies have shown that an increase in lung tumor formation occurred in aging mice exposed to atmospheric photochemical smog over a 16-month study period when compared to controls exposed to filtered air. (Author abstract)##

00992

W.J. Jacumin, D.R. Johnston, L.A. Ripperton

EXPOSURE OF MICROORGANISMS TO LOW CONCENTRATIONS OF VARIOUS POLLUTANTS. Ind. Hyg. J., 25(6):595-600, Dec. 1964.

A technique for exposing microorganisms to air-borne toxicants was developed. Serratia marcescens were exposed to irradiated atmosphere of clean air, No2 at 0.5 ppm, hexene-1 at 2 ppm, and No2 plus hexene-1. Only those containing No2 differed significantly from clean air, suggesting that hexene-1 played no major role. The technique has inherent difficulties, limiting its application pending further development. (Author abstract)##

00994

S.D. Murphy, H.V. Davis, V.L. Zaratzian

BIOCHEMICAL EFFECTS IN RATS FROM IRRITATING AIR CONTAMINANTS. Toxicol. Appl. Pharmacol., 6(5):520-528, Sept. 1964.

The effect of inhalation of acrolein vapors on the activity of several enzymes of male rat tissues was investigated.

Elevated hepatic alkaline phosphatase activity occurred following continuous 40-hour exposure to acrolein at concentrations as low as 2.1 ppm. Exposure to higher concentrations for shorter periods of time also increased liver AP activity, but the effect was not constant with a constant Ct. Inhalation of ozone, nitrogen dioxide, formaldehyde, and sulfur dioxide also increased liver AP activity. It appears that the hepatic AP response is a nonspecific effect and may be a symptom of the alarm-reaction to stress. (Author summary)##

01040

G. B. Haydon, G. Freeman, and N. J. Furiosi

COVERT PATHOGENESIS OF NO2 INDUCED EMPHYSEMA IN THE RAT.
Arch, Environ. Health Vol. 11:776-783, Dec. 1965.

The authors previously have reported effects on rats from exposure to 25 ppm NO2. Additional studies of the pathogenesis of emphysema induced by 12 ppm and of other effects resulting from 4 and 0.8 ppm of NO2 are reported. Also, reversibility of the process following exposure to 25 ppm are described. Rats exposed to 12 ppm developed respiratory disease similar to emphysema in humans. At the lower concentrations, the process was relatively covert and survival longer. A relationship appears to exist between concentration X time to the degree of pulmonary disease. In discussing extrapolation of their results to humans, it was indicated, the combination of widespread low level concentrations of NO2 in the air and the transient intermittent, very high concentrations inhaled with tobacco smoke may contribute to chronic obstructive respiratory disease.##

01077

I. I. Lubowe

THE EFFECT OF AIR POLLUTANTS ON THE SKIN. "DERMATITIS URBIS."
General Practice 27(5):10-1, 27, May 1964.

In older individuals the visible signs of aging skin may become more apparent when continuously exposed to air pollutants. Thus, the existence of a condition which may be referred to as "city skin" is conceivable. It appears justified to conjecture that the pollutants which present respiratory hazards, with continuous long-term exposure, will also affect the epidermis and cutaneous system. The deposition of soot and dust on the skin affects bacterial growth and subsequent physiological activity. Contact dermatitis due to airborne contactants such as smoke and insecticide sprays is common, as well as industrial dermatoses related to acids, organic sulfides, and other substances. It seems logical to attribute the dermatoses of the hands and face to the irritating pollutants of industrial cities. Prophylactic as well as remedial topical formulas must be devised to overcome this insidious effect of air pollution.##

01090

S. D. Murphy

A REVIEW OF EFFECTS ON ANIMALS OF EXPOSURE TO AUTO EXHAUST AND SOME OF ITS COMPONENTS. J. Air Pollution Control Assoc. 14(8):303-8, Aug. 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

The several series of experiments that are summarized in this report have demonstrated that respiratory function and activity patterns of experimental animals are altered during brief exposure to irradiated air:auto exhaust mixtures at concentrations of total exhaust that were only two to three times those that occur in certain urban communities during maximum periods of photochemical air pollution. These physiological alterations are reversible following a single exposure of a few hours duration. Qualitatively different effects on respiratory frequency and tidal volumes occurred as a biphasic response during a single four-hour exposure to exhaust. The data indicated that the qualitative nature of the physiological response was dependent upon the relative concentrations of individual constituents with qualitatively different physiological actions. This may be important to the development and evaluation of control devices or methods, since the elimination of one or a class of chemical agents may shift the physiological-effect balance toward that produced by another agent or class of agents that still remain. (Author summary modified)##

01168

R. F. Lutmer, K. A. Busch, and P. L. DeLong

EFFECT OF NITRIC OXIDE, NITROGEN DIOXIDE, OR OZONE ON BLOOD CARBOXYHEMOGLOBIN CONCENTRATIONS DURING LOW-LEVEL CARBON MONOXIDE EXPOSURES . Atmos. Environ. 1, 45-8, 1967.

Compared to exposure to CO alone, no enhancement of blood carboxyhemoglobin concentrations was observed following 8-hour exposures of rats and mice to low levels of CO plus NO, No2, or O3. (Author abstract)##

01175

A. J. Honour, G. de J. Lee, R. Marshall, and F. D. Stott

RESEARCH ON THE DYNAMICS OF PULSATILE BLOODFLOW IN THE HUMAN PULMONARY ARTERIAL SYSTEM. Oxford Univ., (England), Radcliffe Infirmary. Sept. 1961. 34 pp.
CFSTI,DDC: AD 631920

Details of the final design of a pneumatic flowmeter whole body plethysmograph system are given. The system permits continuous measurement of pulmonary capillary bloodflow in man during simultaneous intravascular pressure measurements. Physiological studies making use of the system are described. The rate of uptake of N2O from the lungs of subjects within the body plethysmograph were measured through several cardiac cycles during slow expiration after a single breath of 80% of N20 in oxygen. The profile of N20 uptake that is obtained throughout the cardiac cycle directly corresponds to the pulmonary capillary blood flow rate at all instants throughout the cardiac cycle. This pattern is pulsatile with each heart beat. Preliminary studies of the relationship between pulmonary capillary blood flow and pulmonary arterial pressure were carried out in normal subjects and in patients with mitral stenosis. In normal subjects, the fastest rate of pulmonary capillary blood flow occurs approximately 0.2 seconds after the peak pressure rise in the main pulmonary artery. This time lag indicates a source of interest for subsequent study both in normal subjects and those with pulmonary hypertension. Another study was that of time relationships between oxygen uptake and CO2 elimination that take place at the lung alveoli capillary interface as a result of pulsatile pulmonary capillary blood flow. It was found that oxygen diffusion and transport from the lung alveoli is pulsatile and corresponds closely to the capillary blood flow pattern obtained from the N20 measurements. Although CO2 is 20 times more diffusible than oxygen, CO2 elimination studies in the plethysmograph indicate that this gas leaves the blood flowing through the lung capillaries at almost the same time that oxygen enters the blood during its pulsatile flow through the alveolar-capillary bed.##

01176

G. de J. Lee, R. M. Marshall, and F. D. Stott

RESEARCH ON THE DYNAMICS OF PULSATILE BLOODFLOW IN THE HUMAN
PULMONARY ARTERIAL SYSTEM . Oxford Univ., England, Radcliffe
Infirmary. Apr. 1960. 30 pp.
CFSTI,DDC: AD 631919

Continuation of work on apparatus to perform continuous measurement in man of pulmonary capillary blood flow with simultaneous intravascular pressure measurement is described. A pneumatic flowmeter has been built which can continuously record gas flow from a 1500 whole litre whole body perspex plethysmograph when a human subject within it inhales nitrous oxide gas. While the flowmeter was being completed, prototype pulmonary bloodflow studies were carried out in the dog using the plethysmograph-nitrous oxide method. In making comparison of this method with the standard Fick (oxygen) method, it is found that the ratio of nitrous oxide to the Fick cardiac output estimation was 1:04 with no systematic variation. With the combined plethysmograph-flowmeter method, a phase lag between pulmonary vascular pressure gradient and pulmonary capillary blood flow was confirmed but no detailed analysis made. Using combined broncho-spirometric and plethysmograph-nitrous oxide techniques, studies of pulmonary capillary bloodflow of each lung separately were made in dogs in whom one main pulmonary artery had been tied when the dog was a puppy. Although there was no oxygen uptake from the operated lung, there was considerable N20 uptake. Responses of the human systemic and pulmonary vascular systems to intravenous synthetic angiothensin were studied using standard techniques. The cardiac output fell as a result of a bradycardia without alteration in stroke volume. There was a marked rise in systemic blood pressure indicating an increase in total peripheral resistance. A slight increase in pulmonary vascular resistance was also detected. Both right and left atrial pressures rose during the infusion.##

01324

E.J. Fairchild, II, S.D. Murphy, H.E. Stokinger

PROTECTION BY SULFUR COMPOUNDS AGAINST THE AIR POLLUTANTS OZONE AND NITROGEN DIOXIDE. Science, Vol. 130-861-862, Oct. 2, 1959.

Two distinct but related pathways of protection against the lethal effects of ozone and nitrogen dioxide are shown by (i) simultaneous inhalation of compounds that furnish -SH or -SS-, or both, and (ii) by injection of thiourea derivatives several days prior to exposure to these oxidant gases. The mechanism of (i) is believed similar to that proposed for the action of radiation-protective compounds; that of (ii) involves the development of a tolerance initiated by the thiourea against the oxidants. (Author abstract)##

01330

J. L. Svirbely and B. E. Saltzman

OZONE TOXICITY AND SUBSTANCES ASSOCIATED WITH ITS PRODUCTION. A.M.A. Arch. Ind. Health 15, 111-8, Feb. 1957. (Presented at the 17th Annual Meeting, American Industrial Hygiene Association, Philadelphia, Pa., Apr. 26, 1956.)

The data obtained from acute inhalation studies indicate that ozone per se is a highly toxic substance to rats, mice, and hamsters. The ozone used in these exposures was generated from various gas mixtures and with two different ozonizers varying in current density. nfrared analysis of the scrubbed compressed air used for the toxicity studies indicated that no traces of organic impurities could be detected. Tests for possible ozone contaminants, such as oxides of nitrogen hydrogen peroxide, and free radicals (HO_2, OH, HO_3, O_4, etc.), in a specially constructed mass spectrometer failed to reveal significant amounts of these substances, and, consequently, it is improbable that they affect the toxicity of ozone in laboratory animals. The injurious effects of ozone appear to be lessened by a previous exposure to relatively low concentrations of ozone for a short period. This tolerance was apparent for at least four and one-half weeks after exposure. (Author summary)##

01335

D. L. Coffin and E. J. Blommer

ACUTE TOXICITY OF IRRADIATED AUTO EXHAUST INDICATED BY ENHANCEMENT OF MORTALITY FROM STREPTOCOCCAL PNEUMONIA. Arch. Environ. Health, 15(1):36-38, July 1967. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper No. 66-22.)

Exposure of mice for 4 hours in each of 10 replicated experiments in atmospheres of auto exhaust yielding 100 ppm carbon monoxide, 0.35 to 0.67 ppm oxidant, 0.50 ti 1.00 ppm nitrogen dioxide, and 0.03 to 1.96 ppm nitric oxide and subsequent exposure to streptococcus aerosol produced a fivefold increase in mortality over those receiving only filtered air and identical simultaneous exposure to streptococci. Actual mortality for mice exposed to auto exhaust was 107 out of 200 and for those exposed to ambient air, 22 out of 200. Studies to determine the end point of effect showed that mortality was enhanced by exhaust containing as little as 25 ppm CO and 0.15 ppm oxidant. These results indicate toxicity of auto exhaust for mice at levels for these two components well below peak ambient concentrations. (Author abstract)##

01346

J. M. McNerney and J. D. MacEwen

COMPARATIVE TOXICITY STUDIES AT REDUCED AND AMBIENT PRESSURES. I. ACUTE RESPONSE. Am. Ind. Hyg. Assoc. J., Vol. 26:568-573, Dec. 1965.

Comparison of the acute response to toxicants at ambient and reduced pressures (5 psia; 100% O2) were made by exposing monkeys, dogs, rats, and mice for 2 weeks of continuous inhalation exposure to NO2, O3 and CC14. The experimental results show a definite reduction in the toxic response to the pulmonary irritants NO2 and O3 at reduced pressure when compared with ambient pressure exposures. With CC14, a systemic toxicant, no significant differences between the animals exposed at ambient or reduced pressure were observed. (Author abstract)##

01369

J.R. McCarroll, E.J. Cassell, W.T. Ingram, D. Wolter

HEALTH AND THE URBAN ENVIRONMENT: HEALTH PROFILES VERSUS ENVIRONMENTAL POLLUTANTS. Am. J. Public Health, 56(2):266-275, Feb. 1966. (Presented at the 92nd Annual Meeting, Epidemiology Section, American Public Health Association, New York City, Oct. 7, 1964.)

A severe and continuing air pollution problem in New York City was demonstrated. The effects of this pollution on the health of the average city dweller are subtle and often masked by symptoms stemming from other causes. Nevertheless, careful analysis of variations in health of a sizable population followed forward in time may discriminate between these different etiologic factors. Subjecting such repetitive observations to the types of discriminating analysis being developed may permit identification of many unsuspected health effects of atmospheric pollution. (Author summary)##

01402

A. P. Altshuller, L. L. Klosterman, P. W. Leach, I. J. Hindawi, and J. E. Sigsby, Jr.

PRODUCTS AND BIOLOGICAL EFFECTS FROM IRRADIATION OF NITROGEN OXIDES WITH HYDROCARBONS OR ALDEHYDES UNDER DYNAMIC CONDITIONS. Intern. J. Air Water Pollution, Vol. 10:81-98, Feb. 1966.

Measurements have been made for chemical reactants and products, condensation muclei and aerosol formation, eye irritation and plant damage when a wide variety of individual hydrocarbons or aldehydes or mixtures of hydrocarbons are irradiated with nitrogen oxides under dynamic conditions in a large chamber. Comparison of these results under flow conditions with static measurements also made in this study show that significant differences do occur in the chemical results obtained. Under dynamic chamber conditions, irradiated higher molecular weight paraffinic hydrocarbon-nitrogen oxide systems appear to be unreactive. The amounts of individual olefins consumed in irradiated multi-component olefin-nitrogen oxide mixtures are the same as in single component olefin-nitrogen oxide mixtures. When aromatic hydrocarbons also are included in the multi-component mixtures, interaction effects are observed. The results of the present study show that irradiated aromatic hydrocarbon nitrogen oxide mixtures not only undergo chemical reactions but also cause appreciable levels of eye irritation, plant damage and aerosol formation. It also has been shown that a representative higher molecular weight aliphatic aldehyde, propionaldehyde, when irradiated with nitrogen oxide will produce eye irritation, and moderate to heavy plant damage. The corresponding irradiated formaldehyde-nitrogen oxide mixtures did not cause damage to any of the plant varieties investigated. Using dynamic chamber conditions irradiated synthetic mixtures containing nitrogen oxides and the initial concentration levels of both olefins and aromatic hydrocarbons present in an irradiated automobile exhaust system will reasonably well reproduce the oxidant, aldehyde, eye irritation and plant damage levels measured in the irradiated automobile exhaust mixture. It is not possible to reproduce these results obtained for an irradiated automobile exhaust system, by irradiating nitrogen oxides and the initial olefin or aromatic hydrocarbon levels only. These results prove that aromatic hydrocarbons as well as olefins contribute a significant portion of the reactivity of irradiated automobile exhaust mixtures.##

01463

G. S. Doyle, N. Endow, and J. L. Jones

THE EFFECTS OF PHOTOCHEMICAL AEROSOLS ON EYE IRRITATION (FINAL REPT.). Stanford Research Inst., South Pasadena, Southern California Labs. June 1961.

An eye-irritation panel has benn exposed to many steady-state reaction mixtures generated in a 520-cubic-foot irradiated stirred-flow reaction chamber. The reactants for one set of exposures were trace concentrations (usually 0.2 to 2.0 ppm by volume) of various hydrocarbons, predominantly olefins, and nitrogen dioxide in purified air. Reaction residence times ranged from one to two hours. Sulfur dioxide was used as an additional reactant (at a concentration of about 0.1 ppm) in a comparable set of experiments. The reacting mixtures were then evaluated for relative eye-irritating ability with and without sulfur dioxide. In addition, the reactants and some of the reaction products, especially formaldehyde, were determined, and the light-scattering and particulate content of the mixtures were measured. Some of the conclusions drawn on the basis of the conditions of reaction and exposure used in this study are: (1) Aerosols derived from the cophotooxidation of sulfur dioxide and from sulfur dioxide itself probably have little, if any, effect on the eye-irritating ability of irradiated reaction mixture; (2) Trace concentrations of branched internal olefins, specifically 2-methyl-2-butene, and of a cyclic olefin, cyclohexene, can produce significant amounts of eye irritants other than formaldehyde and acrolein. (3) The use of dynamic (stirred-flow) conditions considerably enhances the sensitivity of subjects to the irritants; (4) Adding isobutane to a photooxidizing isobutylene-nitrogen dioxide mixture produced no significant effect; (5) The rate of response to an eye irritant is a function of the chemical nature of the irritant or irritants; and (6) Ethylene and propylene can produce significant eye irritation at realistic atmospheric concentrations. (Author summary modified)##

01520

T. D. Sterling, J. J. Phair, S. V. Pollack, D. A. Schumsky, and I. DeGroot

URBAN MORBIDITY AND AIR POLLUTION (A FIRST REPT.). Arch. Environ. Health, Vol. 13:158-170, Aug. 1966.

Hospital admissions in Los Angeles were correlated with air pollution measurements and meteorological data. Once the effect of the day of the week was corrected, fluctuations in air pollution and morbidity correlated extremely highly for relevant diseases.##

01591

J. L. Jones, N. Endon, E. A. Schuck, R. G. Caldwell, C.J. Doyle

A PROGRESS REPORT ON THE CHEMISTRY OF COMMUNITY AIR POLLUTION. Stanford Research Inst., South Pasadena, Southern California Labs. Jan. 5, 1962. 59 pp.

When mixtures of propylene and nitrogen dioxide in concentrations of 0.1 to 1.0 part per million (ppm) were photochemically reacted by irradiation with near ultraviolet light, the reaction products were irritating to the eyes of human test subjects. The intensity of the ultraviolet light used in these laboratory experiments was comparable to 7:00 to 8:00 a.m. fall sunlight. Preliminary additional work on ethylene reaction mixtures, which were irradiated with near ultraviolet light corresponding to 12:00 noon summer sunlight intensity, definitely produced eye irritating reacton product mixtures. The evidence from infrared spectra of precipitated model aerosols formed by the photooxidation of lower olefin homologs - nitrogen oxides - sulfur dioxide mixtures at 50% relative humidity indicated that the principal constituent of the aerosol was sulfuric acid. A study of the dark reaction of ozone with olefins has been initiated. Preliminary experimental results indicate that a kinetic reaction mechanism based on a simple bimolecular reaction between ozone and an olefin cannot account for the experimental results obtained to date. Some the-oretical quantum mechanical calculations have been made that satisfactorily account for some of the experimental rate constants in the literature. (Author summary modified)##

01603

E.A. Schuck, G.J. Doyle, N. Endow

A PROGRESS REPORT ON THE PHOTOCHEMISTRY OF POLLUTED ATMOSPHERES. Stanford Research Inst., South Pasadena, Southern California Labs. Dec. 1960. 122 pp

During the photooxidation of olefins, three reactions appear important: the reaction of olefins with oxygen atoms, with ozone, and with active intermediates. The active intermediates may be free radicals or zwitterions. The rate of disappearance of olefin, over and above that accountable by reaction with oxygen atoms and ozone, has been termed the "excess rate." The importance of active intermediates in the mechanism of olefin photooxidation is suggested by these observations: 1. Some products cannot be accounted for by simple rupture of the double bond. 2. The excess rate is proportional to the square root of the light intensity and to the square root of the initial nitrogen dioxide concentration. The major products of the photooxidation are produced by rupture of the double bond, leading to various carbonyl compounds. However, significant amounts of formaldehyde and acetaldehyde are formed from olefins in certain cases in which these compounds could not be formed by simple bond rupture. Secondary photooxidation of the initial products can also contribute to the products. Alkyl nitrites were identified among the minor products of olefin photooxidation. These nitrites are probably contributing to olefin oxidation since, as was shown previously, alkyl nitrites promote destruction of olefins as well as does nitric oxide or nitrogen dioxide. Medium to severe eye irritation was obtained with photooxidation of mixtures containing 0.5 ppm each of certain olefins and nitrogen dioxide. These concentrations are comparable to those existing in the Los Angeles atmosphere. The amount of eye irritation caused by photooxidation of auto exhaust probably may be reduced most efficiently by control of olefins rather than by control of oxides of nitrogen. This statement is based on studies of olefin mixtures of the type found in auto exhaust; these studies show that, under certain circumstances, reduction of the oxides of nitrogen can lead to an increase rather than a decrease in eye irritation. (Author summary)##

01609

J. Ipsen C.F. Dohan

RELATIONSHIPS OF ACUTE RESPIRATORY DISEASE TO MEASUREMENTS OF ATMOSPHERIC POLLUTION AND LOCAL METEOROLOGICAL CONDITIONS (FINAL REPT.). Pennsylvania Univ., Philadelphia, Henry Phipps Inst.Henry Phipps Inst., Pennsylvania Univ. Mar. 1965. 38 pp.

Three years' studies of the relationship between industrial absenteeism to upper respiratory infections and concomitant air pollution measurements and climatological data are summarized. The purpose is primarily to investigate methods of handling available data, and there are no attempts to hypothesize causative mechanisms between the several components. The variables considered are related in time to a fixed geographical location, which is Metropolitan Philadelphia. The study period began in September, 1960 and ended in December, 1963.##

01785

R. Ehrlich

EFFECT OF AIR POLLUTANTS ON RESPIRATORY INFECTION. Arch. Environ. Health. 6, (5) 76-80, May 1963.

It is apparent from the experimental data that ozone and nitrogen dioxide increase the susceptibility of laboratory mice to respiratory infection caused by inhalation of Klebsiella pneumoniae. Sufficient information is available which indicates that exposure to air pollutants can reduce and make the tracheobronchial tree more vulnerable to airborne bacteria. If the concentration of the pollutant is sufficiently high, permanent damage can occur. The experimental data obtained are compatible with a picture of transient damage of approximately one day, varying with concentration, followed by essential recovery, insofar as mortality is concerned. At lower concentrations this damage is probably only temporary, and recovery follows. (Author summary modified)##

01806

P. Kotin J.L. Falk

ATMOSPHERIC FACTORS IN PATHOGENESIS OF LUNG CANCER. Advan. Cancer Res. 7, 475-514, 1963.

In this review of the atmospheric factors in the pathogensis of lung cancer, the subject is considered under the major headings of: general epidemiological considerations, experimental considerations; bioassay studies, clinical lung cancer; and etiology of lung cancer. There is a bibliography of 194 references.##

01855

J.E. Remmers O.J. Balchum

EFFECTS OF LOS ANGELES URBAN AIR POLLUTION UPON RESPIRATORY FUNCTION OF EMPHYSEMATOUS PATIENTS (REPT. ON STUDIES DONE FROM JULY 1, 1964 - FEB. 1, 1965.) Preprint. 1965.

Four patients with chronic broncho-pulmonary disease have been studied under conditions during which they breathed either highly filtered air or the ambient Los Angeles air. Patients residing in the filtered air rooms and who had moderately severe emphysema showed improvement in lung measurements. Oxygen consumption declined steadily while the patients were residing in the filtered air rooms. The significance of this is not known and will be studied further. (Author abstract)##

01893

O. J. Balchum, R. Buckley, S. Levey, J. Bertolino,
H. Swann, and T. Hall

STUDIES IN EXPERIMENTAL EMPHYSEMA. Arch. Environ. Health 8, 132-8, Jan. 1964. (Presented at the Sixth Annual Air Pollution Medical Research Conference, San Francisco, Calif., Jan. 28-29, 1963.)

Serum antibodies to lung tissue are produced in guinea pigs injected with lung homogenate from animals exposed to noxious gases and from normal animals. Microscopic sections of the lungs revealed the presence of an interstitial pneumonitis. Guinea pigs administered the supernatant obtained by low-speed centrifugation of homologous lung homogenate, and others injected with the sediment obtained by high-speed centrifugation of this supernatant, developed marked changes in the pulmonary vasculature and interstitial pneumonitis. These pathological alterations of the lungs are presumed to be a result of antigen-antibody reactions. Morphological alterations resembling those of human emphysema were not detected. (Author summary)##

01916

V. A. Rjazanov.

CRITERIA AND METHODS FOR ESTABLISHIHG MAXIMUM PERMISSIBLE CONCENTRATIONS OF AIR POLLUTION. Bull. World Health Organ. (Geneva) 32, 389-98, 1965.

Experience in the USSR in establishing standards for air pollution control is described. It is emphasized that health considerations must be main criterion in deciding permissible concentrations, which constitute the "hygienic" standards ultimately to be achieved. Economic and technological reasons may dictate temporary "sanitary" standards, which modify the requirements for a limited period. "Technological" standards relate to the economic and technological consequences of air pollution and do not concern health. The maximum permissible concentrations of toxic substances used in toxicology and industrial hygiene are not sufficiently stringent for general use, and control standards are therefore based on the results of tests carried out on animals and human subjects. Tests on animals show that certain concentrations of toxic substances cause functional changes (e.g., in higher nervous activity, cholinesterase activity, and excretion of coproporphyrin) as well as a number of protective adaptational reactions. The results are used to establish maximum permissible concentrations of pollutants within a 24-hour period. Tests on human volunteers provide a basis for determining the maximum average concentrations at a given time. Reactions to odorous substances give the olfactory threshold and the level of concentration causing respiratory and visual reflexes, as well as subsensory effects such as changes in light sensitivity and in the activity of the cerebral cortex. Morbidity statistics also provide evidence of harmful pollution, but cannot serve as a basis for establishing maximum permissible concentrations, which should aim not only at preventing illness but also at avoiding pathological and adaptational reactions. (Author abstract)##

01987

F. G. Hinners

ENGINEERING THE CHRONIC EXPOSURE OF ANIMALS TO LABORATORY PRODUCED AUTOMOBILE EXHAUST. J. Air Pollution Control Assoc. 12, 527-30, Nov. 1962. (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

A laboratory facility designed for studies to determine the effects of lifetime exposure of experimental animals to auto emissions is described. The emissions produced simulated atmospheric concentrations and conditions generally found in the air of a city like Los Angeles.##

02116

TOXICITY OF NITROGEN DIOXIDE. Stanford Res. Inst. J. 2, (4) 10, Sept. 1966.

The toxicity of NO2 is being studied by Stanford Research Institute because of its occurrence as a combustion product in smog, in tobacco smoke, and its production also as a reaction product of ensilage. In general, for the higher concentrations of NO2 (4 ppm and above), the deleterious effects were roughly proportional to concentration and duration of exposure. Young rats exposed to 12 ppm NO2 continued to grow for the first nine months, but at a reduced rate. The lungs became considerably larger and heavier. At 25 ppm NO2 rats gained little or no weight during the 43 days exposure, but developed lung disease. When returned to clean air, they gained weight rapidly and their breathing improved. All rats, at rest, exposed to all concentrations of NO2 breathed more rapidly than the controls. The rise in respiratory rate roughly corresponding to (3 The rise in respiratory rate roughly corresponding to NO2 concentration. It is important to note that at the low concentration of NO2, such as can occur in severe smog, the disease, known medically as emphysema, could not be induced in the rat within its normal lifetime. Hence it is unsafe to conclude that, because higher concentrations of NO2 can be damaging, even fatal, to rats, low concentrations are harmful to the lungs of man. That remains to be demonstrated, although the evidence is suggestive.##

02213

J.T. Mountain

DETECTING HYPERSUSCEPTIBILITY TO TOXIC SUBSTANCES AN APPRAISAL OF SIMPLE BOOD TESTS). Arch. Environ. Health 6, 357-65, Mar. 1963. (Presented at the 27th Annual Meeting, Industrial Hygiene Foundation, Pittsburgh, Pa., Oct. 24-25, 1962.)

From observations of an apparent aggravation of a hereditary defect (Wilson's disease) by exposure to vanadium and from work on laboratory animals made tolerant or susceptible to ozone and nitrogen dioxide, the conclusion has been drawn that the susceptibility of the individual in relation to environmental exposure should be a matter of concern. It is pointed out that tests for detecting susceptibility to hemolytic effects from drugs and other chemicals have been developed which can also be useful in predicting na individual's response to conditions associated with his employment. A number of factors such as stress, diet, and disease are known to affect erythrocyte and tissue enzyme activity and are discussed in relation to their contribution to the physiologic burden imposed by the working environment. Tests for detection of chemically sensitive red blood cells are considered in reference to their use in distinguishing persons hypersusceptible to effects from exposure to substances encountered in industrial operations. (Author summary) ##

02223

S.D. Mprphy, C.E. Ulrich, U.K. Leng

ALTERED FUNCTION IN ANIMALS INHALING CONJUGATED NITRO-OLEFINS. Toxicol. Appl. Pharmacol. 5, (3) 319-30, May 1963, (Presented in part at the Third Inter-American Conference on Occupational Medicine and Toxicology, Miami, Fla., Aug. 1961.)

Increased total pulmonary flow resistance and tidal volumes and decreased respiratory rates of guinea pigs and decreased voluntary activity of mice occurred during inhalation of the vapors of conjugated nitro-olefins at concentrations near or below the threshold for human, sensory detection. Increasing concentrations increased the magnitude of the effects. Comparison of the effects of 2-nitro-2-butene, 3-nitro-3-hexene, and 4-nitro-4-nonene indicated that the effectiveness on pulmonary function was inversely related to the carbon chain length. However, 4-nitro-4- nonene was slightly more active than the butene and hexene in producing depression of mouse activity. At the low concentrations tested, the effects of nitro-olefins were reversible when the animals were returned to clean air. Injection of atropine sulfate overcame the increased pulmonary flow resistance induced by 4-nitro-4-nonene. The response of animals to inhaled nitro-olefins qualitatively resembles effects which have been observed when animals inhale high concentrations of irradiated automobile exhaust. These effects are, however, relatively nonspecific and are produced by several other irritating vapors and gases which have been shown to be present in measurable quantities in exhaust mixtures. (Author summary) ##

02266

M. C. Battigelli, T. F. Hatch, F. Hengstenberg, and
R. J. Mannella

TRITIATED THYMIDINE LABELING IN THE STUDY OF ACUTE INJURY FROM AIR POLLUTANTS. Arch. Environ. Health 12, 747-50, June 1966. (Presented at the Eastern Section Meeting, American Thoracic Society, Hartford, Conn., Oct. 22, 1965.)

The need to quantify pulmonary injury in small laboratory animals exposed to irritant aerosols has suggested the use of DNA synthesis rate as indicator of cellular homeostasis. Labeling DNA synthesis by an autoradiographic technique employing tritiated thymidine, the effects of inhaled mixture of diluted diesel exhaust, of nitrogen dioxide, and of phosgene, in separate experiments, were followed over a period of a few days from the inhalation. The preliminary results indicate that the DNA synthesis rate offers the advantage of a simple numerical index, well suited to quantifying injury. However the sensitivity of this method appears limited to the effects accompanied by histological abnormalities. The first evidence of change appears within one or two days from the exposure and it tends to disappear a week or so after the exposure. (Author summary)##

02277

H.E. Swann, Jr O.J. Balchum

BIOLOGICAL EFFECTS OF URBAN AIR POLLUTION. UV. EFFECTS OF ACUTE SMOG EPISODES ON RESPIRATION OF GUINEA PIGS.
Arch Environ. Health 12, 698-704, June 1966 (Presented at the 25th Annual Meeting, American Industrial Hygiene Association, Philadelphia, Pa. Apr. 30, 1964.)

Measurement of total expiratory flow resistances were made on guinea pigs on days of unusual conditions of weather and smog. When these resistances were compared with routine monthly measurements on the same animals, significant increases in resistance were found at oxidant levels of approximately 0.30 ppm or more. Also, significant increases in resistance were observed when approximately 40% of alert levels of the oxides of nitrogen, carbon monoxide, and hydrocarbons were present. Only when high temperature was accompanied by approximately 0.30 ppm oxidant did a significant increase in resistance occur. During a smog episode when alert levels of oxidant and 25% of alert levels of carbon monoxide and hydrocarbon were recorded on two successive days, older gunea pigs breathing ambient air had highly significant increases in resistance. Alert smog levels apparently act as a respiratory stress which was more obvious in the older animals. Some animals had little or no response to the smog while some animals greatly responded and had quick recovery; other animals greatly responded to the smog and had a slow recovery or no recovery and died. This suggests a possible individual difference in sensivity to smog among animals of the same species. The pathological findings on the two animals that died during the episode indicated severe pulmonary abnormality. Also, some animals that died within 45 days following the episode and had high resistances during the episode also had pathological pulmonary changes. Gowever, others that had high resistances and died had no such alterations. Although high smog levels produced a significant increase in pulmonary resistance, this response may or may not be related to the degree of impairment.##

02306

K.M. Sancier, G. Freeman, J.S. Mills

ELECTRON SPIN RESONANCE OF NITRIC OXIDE-HEMOGLOBIN COMPLEXES IN SOLUTION. Science 137, (3532) 754-5, Sept. 7, 1962.

The electron spin resonance spectra of solutions of nitric oxide-hemoglobin and nitric oxide-methemoglobin, and whole blood treated at room temperature with nitric oxide, all exhibit resonance with a line width of 83 gauss, a g-value of 2.03, and a spin intensity corresponding to one unpaired electron spin per heme. The minimum detectable concentration of these nitric oxide complexes in solution is 0.00001 M. Solutions were stable in a nitrogen atmosphere but when exposed to air in the absence of nitric oxide the spin intensity decreased with z half-life of about 5 hours. A preliminary examination of blood of rats exposed for 1 and 9 days to 10 ppm of nitric oxide in air showed no electron spin resonance. (Author abstract)##

02332

T. R. Lewis, F. G. Hueter, and K. A. Busch.

EFFECTS OF ATMOSPHERES CONTAMINATED WITH IRRADIATED AUTOMOBILE EXHAUST ON REPRODUCTION OF MICE. Preprint. 1966.

The exposure of mice to irradiated automobile exhaust prior to mating significantly impaired reproductive function in male members of sexual pairs. The impairment was expressed at various stages of reproduction: conception, fecundity, and infant survival. These effects imply that the chromatin content of the sperm was altered. This experiment suggests mutational effects on mammalian cells from components or subsequent products of irradiated automobile exhaust. Significantly, the concentrations of these pollutants were similar to those present in many urban communities today. A direct toxic effect on infant mice was noted during postnatal exposure to irradiated automobile exhaust. Death rates during the first 8 days of life were higher compared to those for controls. (Authors' summary)##

02483

G. Freeman, N. J. Furiosi, and G. B. Haydon.

EFFECTS OF CONTINUOUS EXPOSURE OF 0.8 PPM NO2 ON RESPIRATION OF RATS. Arch. Environ. Health 13, 454-6, Oct. 1966.

Rats were exposed during their natural lifetimes to 0.8 ppm of No2 and examined for clinical and anatomical changes. They grew normally and their behavior was similar to that of controls, except for a sustained elevation in respiratory rate of about 20%. Tachypnea began almost immediately upon exposure and became exaggerated during the latter part of life. Occasional minimal changes in morphology of bronchiolar epithelial cells were not accompanied by either microscopic or gross criteria of obstructive disease. The persistent tachypnea suggests, however, that exposure of a species with a longer life span might develop lesions like those in the rat breathing concentrations greater than 0.8 ppm. Also, adjunctive pollutants and diseases in man may enhance the effects of low concentrations. (Author summary)##

02539

(INHALED NOXIOUS POLLUTANTS.) Pollutants nocifs inhales. (Part of Chapter 1: Les pollutions et "nuisances d'origine industrielle et urbaine. Tome 1. Leur prevention et les problemes scientifiques et techniques qu'elle pose en France.) Premier Ministre, Delegation generale a la recherche scientifique et technique. 13-7, June 1966.

This information on inhaled noxious pollutants, which is presented in brief semi-outline form, deals with: chronic and acute effects, influence of dusts on the lungs, influence of non-carcinogenic pollutants, influence of bacteria and viruses, and principal areas of concern in research. Pollutants must be considered both for their independent effect and for that which is conditioned by the state of health of the person such as that of persons with cardiovascular impairment or chronic bronchitis. Reactions from a number of pollutants, including ozone, nitrous vapors, and carbon monoxide, are of great concern. Research studies are being pursued with synthetic atmospheres in relation to synergistic actions; with studies of the atmosphere in certain areas of Paris during a normal period and during a period of smog; with toxicological studies of certain chemical agents, particularly sulfur dioxide, carbon monoxide, and various fluorine compounds, with a view of fixing their limits of tolerance; with the carcinogenic potential of chemical agents as pollutants; and with consideration of the respiratory tree as influenced by inhaled chemical agents and studies of respiratory insufficiencies. This information is given in a section of Chapter 1 of this monograph. ##

02617

H. G. Boren

CARBON AS A CARRIER MECHANISM FOR IRRITANT GASES. Arch. Environ. Health 8, (1) 119-24, Jan. 1964. (Presented at the Sixth Annual Air Pollution Medical Research Conference, San Francisco, Calif., Jan. 28-29, 1963.)

The question of whether focal areas of lung damage can be produced by mechanisms which concentrate relatively large amounts of irritant gases in sharply localized portions of lung has been investigated by exposing mice to carbon with absorbed NO2. Neither a group of control nor mice exposed to inhalation of carbon alone demonstrated any anatomic abnormality of the lung. Mice inhaling NO2 in concentrations of 250 ppm or greater developed pulmonary edema, but neither single nor repetitive exposures produced parenchymal lung lesions. Mice exposed to inhalation of carbon upon which NO2 was absorbed developed focal destructive pulmonary lesions. The thesis is presented that carbon acted as a carrier mechanism whereby high local concentrations of NO2 within the lung were achieved. Carbon is not considered to be a unique particulate carrier nor is NO2 considered to be a unique absorbed irritant to produce the observed effects. The significance of carbón insofar as air pollution is concerned is not only that it indicates the inhalation of potentially polluted air but also that it at times may allow the transport of damaging substances into the lung, depending upon the conditions present when the carbon was formed and the subsequent history of the newly formed carbon particle before it is inhaled. (Author summary)##

02842

M. W. Korth

EFFECTS OF THE RATIO OF HYDROCARBON TO OXIDES OF NITROGEN IN IRRADIATED AUTO EXHAUST. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution, 64 pp., Oct. 1966
HEW 999-AP-20

As a part of a series of investigations of the problem of vehicle exhaust as an air pollutant, photochemical reactions are being studied in detail by the use of large dynamic irradiation chambers. In these studies exhaust, generated by test vehicles on a dynamometer, is diluted with air and irradiated to simulate the effects of sunlight under mixing conditions similar to those in the atmosphere. The irradiated mixture is used to study chemical reactions and to evaluate plant damage and human eye irritation. In this second series of irradiation tests performed by the Public Health Service, the ratio of total hydrocarbon (HC) to oxides of nitrogen (NOx) was varied between 1-1/2 and 24. Hydrocarbon concentrations were varied from 3 ppm to 12 ppm total carbon; oxides of nitrogen concentrations were varied from 1/4 ppm to 2 ppm. Greatest plant damage occurred when both the HC/NOx ratios and hydrocarbon concentrations were high. The levels of eye irritation were highest at the higher chamber hydrocarbon concentrations. For a given hydrocarbon level, chemical reaction rates were highest at the high HC/¬NOx ratios. (Author abstract)##

02871

A.B. Bosman, A.J.Honour, G de J. Lee, R. Marshall, F.D. Stott

A METHOD FOR MEASURING INSTANTANEOUS PULMONARY CAPILLARY BLOODFLOW AND RIGHT VENTRICULAR STROKE VOLUME IN MAN. Clin. Sci. 26, (2) 247-60, APR. 1964.
CFSTI,DDC AD 636062

A pneumatic flowmeter has been designed for use with the whole body plethysmograph in order to measure the rate of instantaneous gas exchange within the lungs. The flowmeter has a linear response from 0-200 mls./sec., and a uniform response up to 10 c./sec. The rate of N2O uptake by the lungs has been recorded using the plethysmo---body pleth recorded using the body plethysmograph and pneumatic flowmeter in order to measure right ventricular stroke volume. The cardiac output measured by this method correlates closely with the results obtained by the Fick method. Simultaneous pressure and flow measurements within the pulmonary arterial system can be made during cardiac catheterisation in man. Clinical applications of the technique are discussed.##

02969

H. Petri

ASSESSING THE HEALTH HAZARDS OF GASEOUS AIR POLLUTIONS. Staub (English Transl.) 25, (10) 50-7, Oct. 1965.
CFSTI: TT 66-51040/10

Many gases and vapours in molecular dispersion have pathophysiologic effects, that is, effects dangerous to health. Various substances can be detected by smell even if present in air in small quantities, and at a certain concentration they may become a nuisance; these substances are, for instance, mercaptans, butyric acid, acrolein and amines, such as trimethylamine; hydrogen sulphide, carbon disulphide, pyridine, etc. cause nuisance at slightly higher concentrations. Sulphur oxides, hydrogen fluoride and other acid aerosols, further, ozone, chlorine, bromine and nitrous gases are dangerous to health, because they irritate body tissue. As a result of the increase in road traffic the odourless carbon monoxide has become very important. The biological assessment of gas or vapour emission with regard to their effect on man, and special effects of these substances are discussed in detail. (Author summary) ##

03083

W.S. Spicer, Jr., W.A. Reinke, H.D. Kerr

EFFECTS OF ENVIRONMENT UPON RESPIRATORY FUNCTION. II. DAILY STUDIES IN PATIENTS WITH CHRONIC OBSTRUCTIVE LUNG DISEASE. Arch. Environ. Health 13, 753-62, Dec. 1966

The effects of selected meteorologic changes and air pollutants upon the mean daily values of ten respiratory function tests obtained from small groups of patients with chronic bronchitis or bronchial asthma have been assessed for two seven-week study periods. A logical biostatistical approach, which places chief reliance upon the multiple regression technique, has been used to sort out major effects from a mass of data. The most important environmental-physiologic relationships appeared to be those associated with temperature, wind speed, barometric pressure, and sulfur dioxide levels. Two distinct patterns of physiologic response were found. In the final analyses, total lung capacity (TLC) and residual volume (RV) were used to exemplify the volume group and airway resistance at functional residual capacity and percentage of the forced bital capacity exhaled in three seconds (FEV 3.0%) the "resistance" group. Airway resistance and TLC increased as temperture decreased. Airway resistance increased and FEV 3.0% fell in both patient groups and RV increased in patients with asthma either 14 or 38 hours (or both) following a rise in sulfur dioxide in the second study where the range of sulfur dioxide levels was greater than in the first study. Airway resistance increased and FEV 3.0% decreased 24 hours after a fall in barometric pressure while TLC and RV rose in patients with chronic bronchitis 14 hrs. after a drop in wind speed. Particular care has been taken to point out that a direct cause and effect relationship cannot be implied from these significant findings. (Author summary) ##

03151

M. Corn and G. Burton

THE IRRITANT POTENTIAL OF POLLUTANTS IN THE ATMOSPHERE. Arch. Environ. Health 14, 54-16, Jan. 1967. (Presented at the Eighth Annual American Medical Association Air Pollution Medical Research Conference, Los Angeles, Calif. Mar. 2-4, 1966.)

Irritant substances have been thought of as producing acute, and eventually chronic, surface inflammation of tissues. Over the last ten years the meaning of the term "irritant" has been altered; it is now used to describe a group of substances which elicit other types of human and animal responses, as well as inflammation. Concentrations, size and distribution of irritant substances in polluted atmospheres and the concept of the nature of irritants are described. Author recommends that airborne particulate pollutants should be assessed with respect to aerodynamic particle size because chemical composition of particles has been demonstrated to vary with size, and only certain particle sizes present in polluted atmospheres are capable of reaching receptors after inhalation by man. Among the defects of present routine sampling methodologies are size distribution of sampled particles, the optimum density of sampling stations for the procurement of reliable results, and the irritant potential of pollutant mixtures when single pollutants are evaluated.##

03214

REPORT ON THE RESULTS OF INVESTIGATION OF THE EFFECTS OF AUTOMOBILE EXHAUST ON THE HUMAN BODY. Kuki Seijo (Clean Air -J. Japan Air Cleaning Assoc., Tokyo) 4(1):39-43, 1966.

The measurement of CO, soot, nitrogen oxides, SO2, SO3, and hydrocarbons and their medical psychological effects on the human body were investigated in September, 1965 in two regions with contrasting amounts of daily traffic. A quiet region to be considered was the vicinity of Ohara-Machi Setagagya-ku, Tokyo and the other was in the vicinity of National Hygienic Laboratory at Yoga-cho Setagaya-ka, Tokyo. The results are stated categorically for each air pollutant. To determine environmental effects meteorological data were supplied by Tokyo District Central Meteorological Observatory.

03254

R. P. Sherwin, S. Winnick, and R. D. Buckley

THE RESPONSE OF LACTIC ACID DEHYDROGENASE POSITIVE ALVEOLAR CELLS IN THE LUNGS OF GUINEA PIGS EXPOSED TO NO2. Preprint. 1966.

A method has been developed for determining the ratio of alveolar cells to alveoli, utilizing lactic acid dehydrogenase reactivity of alveolar cells to identify the cells and gelatin inflation of the lung to permit counting of the alveoli. Ratios have been d determined on the lung sections from guinea pigs previously exposed to NO2 (15 ppm continuously for three months) and have been compared with those of lungs from control animals. Significant differences were found between the two animal groups and the ratios within each group have been found to be consistent. Applications for related areas of investigation have been suggested. (Author summary) ##

03257

R. D. Buckley and O. J. Balchum

EFFECTS OF NITROGEN DIOXIDE ON LACTIC DEHYDROGENASE ISOZYMES. (Arch. Environ. Health 14, 424-8, Mar. 1967.) 1965

Lactic dehydrogenase (LDH) isozyme patterns were examined in guinea pigs after 26, 33 and 40 days continuous exposure to 15 ppm nitroge dioxide (NO2). Isozymes were separated from lung, liver and kidney tissue homogenates from exposed and unexposed animals by disc electrophoresis. Gel samples were incubated with NAD and lactate, and nitro-BT tetrazolium was employed as coupling agent. Relative distributions of the isozyme was determined by densitcmetry. Inhalation of NO2 resulted in a decrease in the relative amounts of the fast-moving (aerobic) isozyme and an increase in the slow-moving (anaerobic) isozyme in lung. Isozyme patterns in liver and kidney were not significantly altered following any of the exposure periods. (Author summary) ##

03258

R. D. Buckley and O. J. Balchum

ENZYME ALTERATIONS FOLLOWING NITROGEN DIOXIDE EXPOSURE. (Arch Environ. Health 14, 687-92, May 1967.) 1966

Oxygen consumption aldolase and lactic dehydrogenase determinations were performed on guinea pig lung, liver, kidney and spleen tissue homogenates following continuous exposure to 10 ppm nitrogen dioxide for varying periods of time. Inhalation of NO2 resulted in increased oxygen consumption values in lung but also in kidney tissue for each exposure period. Oxygen consumption in liver and spleen homogenates was significantly elevated following thirty-two days exposure but did not show a consistent increase after other exposure periods. Aldolase activity was significantly elevated in lung following twelve days, and in lung and liver following thirty-two days exposure to NO2. Significant decreases in aldolase activity were noted in lung, kidney and spleen after twenty-six days exposure. LDH values were increased in lung, liver and kidney as a result of inhalation of NO2. The possibility of the presence of circulating substances resulting from the interaction of NO2 and lung or blood tissue, and/or a general physiological 'stress' reaction were suggested as possible explanations for enzyme and oxygen consumption alterations observed in kidney, liver and spleen. The possible effects of respiratory infection on the metabolism of lung tissue was also discussed. (Author summary) ##

03261

V. Richters, R. P. Sherwin, R. D. Buckley, O. J. Balchum, and Ivler

PSEUDOMONAS: DELAYED OCCURRENCE IN LUNG TISSUE CULTURES FROM GUINEA PIGS EXPOSED TO NO2. Am. Rev. Respirat. Diseases 94, (4) 569-73, OCT. 1966.

In a tissue culture study of the lungs of guinea pigs previously exposed to 10 ppm of NO2, it was noted that numerous cultures produced Pseudomonas aeruginosa after one week or more of in vitro life. This previously unreported phenomenon is considered to be unique since bacterial contamination or the use of infected tissud for culture results in diverse types of bacterial growth, either shortly after explanation or after the use of contaminated media. Furthermore, lung cultures of non-exposed guinea pigs were only occasionally positive for Pseudomonas aeruginosa and there were no instances of bacterial growth of any type in the numerous cultures of various other tissues, human and animal, prepared simultaneously in an identical manner. Finally, the number of guinea pig lungs yielding cultures positive for Pseudomonas increased in accordance with the duration of prior exposure of the animals to NO2. (Author abstract)##

03270

W. J. Hamming and R. G. Lunche

EFFECTS OF EMISSIONS OF ORGANIC SOLVENTS ON LOS ANGELES PHOTOCHEMICAL SMOG. Proc. Tech. Meeting West Coast Section, Air Pollution Control Assoc., 3rd Monterey, Calif., 1963 153-84 pp.

Irradiation of mixtures of solvents and nitric oxide or solvents and auto exhaust will produce ozone, aerosols and eye irritation. The aromatic solvents produce the most eye irritation, and their effectiveness is about 6/10 of that of auto exhaust. The mixed ketones and chlorinated hydrocarbons are the next most active in producing eye irritation, and their effectiveness is about 1/5 that of auto exhuast; methyl ethyl ketone, the low-boiling alkanes, and the mixed alcohols are on the average, much less active in producing eye irritation. The high-boiling alkanes are unreactive. Relative to their effect on aerosol formation, or growth of aerosol, the solvents tested may tentatively be listed in the following order: 1. Aromatic Solvents, at 2 ppm - 1.2 ppm auto exhaust - greater increase in growth of aerosols 2. Chlorinated Hydrocarbons = Next in order - half the effect of aromatics or less 3. Mixed alcohols = Questionable effect on aerosol growth 4. LB Alkanes = Questionable effect 5. Mixed Ketones = May have slight effect 6. MEK = No effect 8. HB Alkanes = No effect. There is a general tendency for high concentrations of solvent to form more ozone than low concentrations. The quantities of ozone formed by irradiation of various solvents have the following orders of magnitude: (a.) Aromatics and HB alkanes produce about 1/15 ppm ozone per ppm of solvent. (b.) LB alkanes and chlorinated hydrocarbons produce about 1/20 ppm ozone per ppm of solvent. (c.) Mixed ketone (probably the active one is isobutyl ketone), 1/25 ppm ozone per ppm of solvent. (d.) Mixed alcohols and MEK form about 1/30 ppm ozone per ppm solvent. When mixed with auto exhaust at only 4 ppm the LB alkanes, HB alkanes and mixed ketone show ozone formation that has significant difference from that of auto exhaust alone. Under similar conditions both aromatic and Cl-HC show positive, but significant effect on ozone formation. A larger and more significant effect might be shown is 8 ppm of these solvents had been used. The effect of solvent on the formation of ozone when mixed with auto exhaust is much less than when they are mixed with nitric oxide and irradiated.##

03394

E.J. Catcott

EFFECTS OF AIR POLLUTION ON ANIMALS. World Health Organ. Monograph Ser. 46 (Air Pollution), 1961. pp. 221-31.

The report of animal morbidity and mortality which followed major air pollution episodes would be regarded critically. The investigations of these acute and intense exposures to air pollution have been done retrospectively. It is significant that the owners' reports of injury to animals could not be corroborated by professional observers at the Donora disaster. The high rate of animal mortality which allegedly occurred at Poza Rica is generally in contradiction to the information concerning the relative susceptibility to air pollutants of animal species which have been studied experimentally. The synergistic roles of physiological and of external environmental influences on reactions to air pollution indicate that the interactions of many factors may be necessary to produce critical situations. In contrast to the paucity of information concerning natural exposure to most air-borne pollutants, the effects of fluorides on animals have been defined well. Laboratory research has provided important information concerning the effects of specific pollutants on animals. Mice, rabbits, guinea-pigs, rats and monkeys have been utilized to demonstrate the toxic properties of such air pollutants as sulfur dioxide, sulfuric acid, hydrogen sulfide, ozone, nitrogen dioxide, organic compounds, and some dusts. Information which has been obtained by artifiicial exposure of animals is providing some indices of both human and animal effects to be expected from natural exposures. A well-integrated attack, in the field and in the laboratory, will be necessary to divulge the true details of the biological effects of polluted air. (Author summary modified)##

03421

H. H. Schrenk, H. Heimann, G. D. Clayton, W. M. Gafafer, H. Wexler

AIR POLLUTION IN DONORA, PA. (¬EPIDEMIOLOGY OF THE UNUSUAL SMOG EPISODE OF OCTOBER 1948, PRELIMINARY REPORT). Public Health Bulletin No. 306. 1949. 203 pp.
GPO, HEW

In the latter part of October 1948, Donora, Pennsylvania, a town of about 13,000 population, containing a zinc plant and a steel and wire plant, experienced a large number of acute illnesses and 20 deaths during a heavy smog. This report is based upon a carefully made epidemiological study, approached from the biological, the engineering, and meteorological point of view. The data collection began after the episode was over and included: (1) Studies of acute morbidity by house-to-house vanvass, records of fatal and hospitalized patients, and finally, study of general morbidity; (2) Study of chronic morbidity by dental examinations of school children, by certain chest roentgenograms, and morbidity of selected groups of individuals; (3) Study of mortality records of the community and comparing them with similar records of neighboring towns; (4) Atmospheric studies of air pollutants; (5) Evaluation of industrial plant effluents; (6) Evaluation of air contaminants from other sources; (7) Description of the topography of the valley in which the town is located; (8) Micrometeorological studies of the valley; (9) Description of the weather during the acute episode in October, 1948. Detailed descriptions of the methods used are presented since it was believed they would be useful to other making similar studies. The study showed that the cause of the episode was an accumulation in the atmosphere of chemical irritants, this accumulation resulting from the weather inversion which existed in this part of the country during the fateful days. The parts played by all sources of chemical air contamination are discussed. A section is devoted to discussing the specific agent or agents probably responsible for the illnesses, and it is deduced that no one agent can be indicated. It was likely that it was due to a chemical irritant (possibly sulfur dioxide) plus particulate matter, although, because of the lack of knowledge about the toxic effects of low concentrations of the irritant gases, this cannot be said with certainty.##

03429

D. D. Van Slyke.

THE GASES OF THE BLOOD. Brookhaven Natl. Lab., Upton, N. Y., Lecture Series No. 41. Nov. 18, 1964. 20 pp.
CFSTI: BNL 898(T366)

Blood gases and their physiological and medical significance are discussed in this review. Those contained in the blood in significant amount under ordinary conditions are O2 and N2 that are absorbed from the air, and CO2 that is produced in the body, the most important to existence being O2. The poisonous effect of CO gas was demonstrated by Haldane's study of coal mine disasters in which he showed that CO displaces O2 from combination with hemoglobin, thus depriving hemoglobin of its ability to supply oxygen to body tissues. CO has more than 200 times as great an affinity as O2 for hemoglobin, so that if the air breathed has one part per thousand of CO, half of the hemoglobin will combine with CO. Various other highlights in this field of medical research are discussed briefly. ##

03521

B. A. Cross and I. A. Silver

UNIT ACTIVITY IN THE HYPOTHALAMUS AND THE SYMPATHETIC RESPONSE TO HYPOSIA AND HYPERCAPNIA. Exp. Neurol. 7, (5) 375-93, Mat 1963.
DDC, CFSTI: AD 632803

The activity of 232 neurons in the hypothalamus and other forebrain regions was recorded with stereotaxically oriented steel microelectrodes in rabbits under light urethane anesthesia. Inhalation of N_2 or N_2O for 10 to 30 sec reduced brain oxygen tension by 30 to 90 per cent and accelerated the firing rate of 27 per cent of neuron tested. Slowing to hyposia occurred in 36 per cent. Inhalation of 80 per cent CO_2 and 20 per cent O_2 for 5 to 15 sec elevated brain oxygen tension and 90 per cent of the neurons tested gave a response to this stimulus. In the hypothalamus thirty-one of forty-six neurons were accelerated by hypercapnia. A high proportion of tested neurons in the posterior and lateral areas of the hypothalamus were excited by hypoxia, hypercapnia and pain or auditory stimuli. In addition to the effects on neuron firing, hypoxia and hypercapnia produced a rise in arterial pressure, bradycardia and an activation of the electrocorticogram. Similar changes were elicited by electrical stimulation of the sympathetic zone of the hypothalamus. It is suggested that the cerebrovascular supply may be regulated in part by "sympathetic" neurons in the hypothalamus responsive to hypoxia or hypercapnia. (Author abstract)##

03530

W. D. Wagner, O. J. Dobrogorski, H. E. Stokinger

ANTAGONISTIC ACTION OF OIL MISTS ON AIR POLLUTANTS (EFFECTS ON OXIDANTS, OZONE AND NITROGEN DIOXIDE). Arch. Environ. Health 2, 523-34, May 1961

Both mineral and motor oil mists are capable of reducing acute lethal effects of the respired oxidants, ozone and nitrogen dioxide, in mice. The protection is demonstrable only after a latent period following exposure to the oil mist; simultaneous exposure to oil mist and oxidant results in a moderate intensification of toxicity. The protection following a single few hours' exposure to the oil mist persists for several days, but is no longer demonstrable after 8 or 9 days. The protection is not markedly dependent on concentration above a minimal time-intensity of the oil mist exposure; 1 ppm oil mist, if inhaled for a few days, will provide measurable protection. The effective particle-size range of the oil mist for the mouse was found to lie between 0.5 and 1.2 micron mean diameter at a standard geometric deviation of 1.6. Histologic examination of the respiratory tract was characterized by marked macrophagic mobilization and infiltration following an oxidant or oil-plus-oxidant exposure, but not from an oil exposure alone. Despite protection of the lung from the acute effects of potent respired oxidants, tolerance of ozone developed., indicating incomplete protection (surface covering) of the lung by oil. Repeated inhalation of oil mists for a few weeks appears to result in a decrease in the protection. A tentative mechanism of oil-mist protection against the oxidants, O_3 and NO_2 has been proposed. (Author summary)##

03603

W. M. Diggle J. C. Gage
THE TOXICITY OF OZONE IN THE PRESENCE OF OXIDES OF NITROGEN. Brit. J. Ind. Med. (London) 12, 60-4, 1955.

The concentration of ozone which causes 50% mortality to rats and mice exposed for one period of four hours has been found to be in the region of 10 to 12 p.p.m. The cause of death is acute pulmonary oedema. Dilute mixtures of ozone and nitrogen dioxide in air react in part to give nitrogen pentoxide, the amount produced depending on the concentrations of the reactants. The toxic effects of ozone and nitrogen pentoxide are qualitatively similar, though the latter is about three times as active as the former. The effects are additive and the observed increase in the toxicity of an ozone atmosphere brought about by the presence of oxides of nitrogen can be adequately attributed to the nitrogen pentoxide present. The effect of these observations on the assessment of the toxic hazard from industrial ozone concentrations is discussed. (Author summary, modified)##

03619

H. E. Stokinger

EVALUATION OF THE HAZARDS OF OZONE AND OXIDES OF NITROGEN (FACTORS MODIFYING TOXICITY). A. M. A. Arch. Ind. Health No. 15:181-90, March 1957. (Presented at the International Ozone Conference, Chicago, Ill., Nov. 30, 1956.)

Experimental evidence is presented that ozone in single acute exposure is a highly poisonous substance to laboratory animals. No experimental evidence was found that this toxicity is modified to a significant degree by the presence of nitrogen oxides that may accompany ozone production. Seven factors have been experimentally found that may modify the toxicity of ozone. Four of these, youth, physical exertion, alcohol, and respiratory infection, tend to augment the injurious response or act to the detriment of the host; the remainder, intermittent exposure, premedication, and pre-exposure, either reduce or eliminate the injurious effects of ozone. Consideration has been given these factors in the evaluation of possible hazards to populations from ozone-containing smogs. (Author summary)##

03625

C. E. Thorp

INFLUENCE OF NITROGEN OXIDES ON THE TOXICITY OF OZONE. J. Am. Chem. Soc. (News Ed.) 19(12):686-688, June 25, 1941.

This report points out a possible cause of discrepancy between investigators of the toxicity of ozone, shows how the source of ozone influences the toxicity, and illustrates with test data which have been obtained over a period of years in this laboratory. Tests on B. coli, weevils, and algae show a large difference of toxicity between pure ozone and ozone containing nitrogen oxides. The variance of opinion in the literature on ozone toxicity is probably due to results obtained with ozone containing varying amounts of nitrogen oxides. Ozone free of oxides of nitrogen is non-toxic in concentrations below 20 parts per million. Ozone plus nitrogen oxides may be more toxic than nitrogen oxides alone and should be investigated further. Ozone containing 47 percent nitrogen oxides has bactericidal properties in concentrations over 3 parts per million, but pure ozone does not exhibit bactericidal properties below 50 parts per million.##

03813

Vernot, E. H.

ANALYTICAL CONTROL OF CONTAMINANT CONCENTRATION IN EXPOSURE CHAMBERS. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th), Wright-Patterson AFB Ohio, Contract AF 33(657)-11305, Proj. 6302. AMRL-TR-65-230, p. 27-33, Nov. 1965. 4 refs.
CFSTI, DDC: AD 629622

Methods used at the Toxic Hazards Research Laboratory in the control of low concentrations of contaminants introduced into exposure chambers of various sizes are outlined. For ozone the method consists of pumping through a glass sampling tube or tonometer, and isolation of the sample after sufficient pumping for equilibration. The tonometer has a sidearm which can be capped for sub-sampling by syringes or which may be used for the addition of reagent solution. This method of sampling has proved superior to fritted bubblers. For nitrogen dioxide, the Saltzman method is used. For carbon tetrachloride, gas chromatography is used. Analytical techniques described require relatively simple operations which a technician can carry out with ease and precision. With this system, satisfactory control was maintained over contaminant concentrations in exposure chambers.##

03820

McNerney, J. M.

PRELIMINARY RESULTS OF TOXICITY STUDIES IN 5 PSIA 100% OXYGEN ENVIRONMENT. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th), b8Wright-Patterson AFB, Ohio, Contract AF 33(657)-11305, Proj. 6302, AMRL-TR-65-230, p. 98-123, Nov. 1965.
CFSTI, DDC: AD 629622

A 90-day continuous exposure of mice, rats, beagles and monkeys to a 5 pounds per square inch absolute and 100% oxygen environment produced the following pertinent results: A Wistar-derived strain of rats proved to be sensitive to altitude conditions early in the exposure (15% mortality within 14 days of exposure) whereas a Sprague-Dawley-derived strain proved resistant. A possible association of increasing serum glutamic pyruvic transaminase levels in beagles with length of exposure was found. Except for these factors, the experimental animals gave no apparent indication of being stressed throughout the expsoure. A one-year study has been initiated to determine if the enxyme change was due to sampling or is indicative of an accumulating stress. No significant increase in the toxic response of animals to inhaled atmospheric contaminants (carbon tetrachloride, nitrogen dioxide, and ozone) under conditions of 5 psia and 100% oxygen was noted when compared with animals exposed under normal atmospheric conditions (except in the case of mice exposed to carbon tetrachloride). Based upon mortality data, a definite reduction in toxic response to pulmonary irritants was found in the presence of reduced pressure (5 psia) and 100% oxygen when compared with ambient pressure at the same concentration for two weeks continuous exposure. This difference in toxic response may be a beneficial effect derived from the increased partial pressure of oxygen in the experimental chambers even though total pressure has been reduced. Specifically, this is an increase in oxygen partial pressure from approximately 150 millimeters Hg pO2 to 255 millimeters Hg pO2. This increase in oxygen tension at the pulmonary surface may be acting therapeutically against the pulmonary edema produced by the lung irritatns, ozone and nitrogen dioxide. In the case of carbon tetrachloride, a systemic toxicant, no such benefits were observable.##

03821

Back, K. C.

REVIEW OF AIR FORCE DATA FROM LONG TERM CONTINUOUS EXPOSURE AT AMBIENT PRESSURE. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th), Wright-Patterson AFB, Ohio, Contract AF 33(657)-11305, Proj. 6302, AMRL-TR-65-230, p. 124-133, Nov. 1965.
CFSTI, DDC: AD 629622

Work which was performed under Air Force sponsorship in the area of environmental toxicology of space cabin atmospheres over the past 5 years is described. This work gave the warning that materials in trace quantities could prove toxic when presented to animals over long continuous exposure periods. Four exposure chambers were constructed for this work. This permitted use of one for a control group of animals and three for contaminant exposure chambers. All animals were followed by a number of clinical laboratory examinations before, during and following the 90-day exposure, and the animals were terminally given stress tests and then necropsied with both gross and microscopic examination of tissues. Carbon tetrachloride, while not causing death at 25 ppm, did cause serious clinical and microscopic liver changes in all animals exposed. The livers of the rats were so much involved that the pathologist made a diagnosis of "cirrhosis". Phenol caused absolutely no problems whatsoever at the 5 ppm level Hydrogen sulfide (20 ppm) did produce death in rats and mice, but none in monkeys. Methyl mercaptan (50 ppm) caused serious problems and death in 40% of the monkeys and 43% of the mice. Tests were conducted to find out whether animals could perform strenuous tasks following the 90-day exposure and to compare the long term, continuous toxicity of some propellants and propellant types in which the Air Force has an interest. Hydrazine, unsymmetrical dimethyl hydrazine, nitrogen dioxide and decaborane were tested as candidate materials. The results are discussed.##

03822

Siegel, J.

REVIEW OF AMBIENT PRESSURE ANIMAL EXPOSURE DATA FROM SELECTED NAVY COMPOUNDS. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965, Aerospace Medical Research Lab., (6570th), Wright-Patterson AFB, Ohio, b8contract AF 33(657)-11305, Proj. 6302, AMRL-TR-65-230, p. 134-147, Nov. 1965.
CFSTI, DDC: AD 629622

Studies have been oriented toward operational requirements in a resolution of existing or anticipated problems, although basic research aspects are included in the Navy mission. For example there was, and still is, a constant need to search for better methods of contaminant generations, for more reliable methods of analysis and monitoring, for new bio-chemical predictors, and for new ways of getting more information from the exposed animal. Some chamber modifications, animals used, parameters studied, and classes of materials studied are discussed. Experimental results and plans for the future for the Navy Toxicology Unit are summarized.##

03823

Hueter, F. G.

LONG TERM INHALATION EXPOSURE EXPERIENCE WITH REFERENCE TO AIR POLLUTION. In: Proceedings of the Conference on Atmospheric Contamination in Confined Spaces: 30 March - 1 April 1965. Aerospace Medical Research Lab., (6570th), Wright-Patterson AFB, Ohio, Contract AF 33(657)-11305, Proj. 6302, AMRL-TR-65-230, p. 148-165, Nov. 1965.
CFSTI, DDC: AD 629622

As part of the overall program by the Division of Air Pollution the Laboratory of Medical and Biological b8sciences has been charged with studying the biological effects of plants and animals, including man, of chronic exposures, long term exposures to air pollution as it exists in the ambient atmosphere of communities. The concentration has been on mixtures of normal air pollution, not single agents or simple mixtures of pure gases. The initial studies discussed primarily are concerned with chronic exposure to auto exhaust-contaminated atmospheres, both raw auto exhaust as it comes from the tail pipe, as well as irradiated auto exhaust which simulates the photochemistry that occurs due to sunlight. The results with laboratory animals are discussed.##

03853

R. Ehrlich

EFFECT OF NITROGEN DIOXIDE ON RESISTANCE TO RESPIRATORY INFECTION. Bacteriol. Rev. 30, (3) 604-14, Sept. 1966

The effects of acute and chronic exposures to nitrogen dioxide, one of the most abundant atmospheric contaminants in many communities, on the resistance to infection produced by respiratory challenge with airborne Klebsiella pneumoniae is discussed. The reduction in the resistance to infection by a synergistic effect provides a sensitive indicator of the biological effects of nitrogen dioxide. A single 2-hr exposure of inbred mice to 3.5 ppm of NO_2 before or after respiratory challenge with aerosol of K. pneumoniae significantly increases the mortality. The same effect produced in squirrel monkeys and hamsters required 35 ppm for 2 hr. The effect of a single 2-hr. exposure was not persistent and a return to normal resistance to infection occurred in 24 hr after the NO_2 exposure. Exploratory studies of the mechanism of the increased susceptibility to infection suggests that the NO_2 permits better colonization in the lungs of mice and hamsters. Extrapolation of this work to man or to the resistance to other species of pathogenic organisms can be only speculative.##

03890

C. H. Hine, F. H. Meyers, F. Ivanhoe, S. Walker, and G. H. Takahashi

SIMPLE TESTS OF RESPIRATORY FUNCTION AND STUDY OF SENSORY RESPONSE IN HUMAN SUBJECTS EXPOSED TO RESPIRATORY TRACT IRRITANTS. Proc. Symp. Human Exposures to Air Pollutants, Fifth Air Pollution Medical Research Conf., Los Angeles, Calif., Dec. 4, 1961. pp. 20-38.

This report summarizes two basic studies regarded by the investigators as necessary antecedents to the orderly development of research in chronic obstructive ventilatory disease. One study evaluated the degree of sensory responses and the threshold of detection for several agents. The sensory responses in this study were carried out primarily to determine whether changes in respiratory function would be achieved at levels at which there was no significant sensory response to irritant gases.##

03978

S. W. Nicksic, J. Harkins, L. J. Painter

STATISTICAL SURVEY OF DATA RELATING TO HYDROCARBON AND OXIDES OF NITROGEN RELATIONSHIPS IN PHOTOCHEMICAL SMOG. Intern. J. Air Water Pollution 10, (1) 15-23, Jan. 1966.

Results from various photochemical irradiation chamber experiments were examined by statistical procedures to determine the effect of hydrocarbon and oxides of nitrogen concentrations on eye irritation. The regression equations are given together with graphs drawn from these equations. Some aspects of the practical interpretation of the results are discussed. Data on existing ambient concentrations of hydrocarbon and oxides of nitrogen in the Los Angeles atmosphere are compiled. (Author abstract)##

04213

I. G. Mobbs, G. D. Parbrook, and J. McKenzie

THE EFFECT OF VARIOUS CONCENTRATIONS OF NITROUS OXIDE ON THE 24-HOUR EXPLANTED CHICK EMBRYO. Brit. J. Anaesthesia (Altrincham) 38, (11) 866-70, Nov. 1966.

The effects of nitrous oxide on the early explanted chick embryo were investigated using the technique of New (1955). After 22 hr incubation the embryos were explanted and exposed for a further 24 hr to the following gases: air, nitrous oxide (25 per cent), nitrous oxide (60 per cent), and nitrous oxide (79 per cent). The oxygen concentration was maintained at normal levels (20.9 per cent) and the balance of the gases was nitrogen. In a fifth trial a 60 per cent nitrous oxide-40 per cent oxygen mixture was used. After exposure the embryos were examined under the dissecting microscope and in histological sections. These revealed no effect on the chick embryo after treatment with nitrous oxide for 24 hr. (Author summary modified)##

04221

V. P. Paribok and F. A. Ivanova

AIR TEMPERATURES AND THE TOXIC EFFECTS OF NITROGEN OXIDES. Fed. Proc. (Transl. Suppl.) 25, (5) (Part II) T851-3, Oct. 1960. Russ. (Tr.) (Gigiena Truda i Professional'nye Zabolevaniya (Moscow) 9, (7) 22-4, 1965.)

The influence of temperature on the toxicity of the nitrogen oxides to mice is reported. The nitrogen oxides were produced by the action of nitric acid on copper and the proportions of NO and NO_2 were estimated. The mice were exposed to various concentrations of nitrogen oxides over the temperature range 10 to 35 degrees C in desiccators. The toxic effects were least at 15 degrees C. There was less methemoglobin in the blood at high temperatures. The toxic effects of the nitrogen oxides are greater at high temperatures because of the disturbance of heat regulation and reduced oxygen consumption. At low temperatures the toxic effects are increased by increased methemoglobin formation and the disturbance of heat regulation.##

04243

B. Petr and P. Schmidt

EFFECT OF AIR POLLUTED WITH SULFUR DIOXIDE AND NITROGEN OXIDES. (Vozdeistvie na organizm atmosfernogo vozdukha, zagryaznennogo sernistym angidridom i okislami azota.) Hyg. Sanit. 31, (7) 111-21, July 1966. Russ. (Tr.)
CFSTI: TT 66-51160/7-9

An attempt was made to provide answers to questions concerning the effect of atmospheric air polluted with sulfur dioxide and nitrous gases on the health of children living in such environments over long periods; to find out the nature of the combined chronic effect of these health hazards in the atmosphere, and to formulate preventive measures for reduction of the harmful effect of the polluted atmosphere. Investigations were carried out in two areas, in the environs of the towns Lovosice and Pardubice. In each area, three groups of children were studied living under very similar economic and climatic conditions, which differed only in the degree of atmospheric pollution. It was found that residence in an environment polluted by a mixture of both pollutants has more serious effects than a stay in an environment polluted mainly by one of them (SO2), provided the ratio of the two substances is 1:1. If the nitrogen oxides are present in excess over the concentration of sulfur dioxide, the effect of the mixture is potentiated. If the concentration of sulfur dioxide is higher with respect to that of nitrous gases, the effects of the two mixture constituents are mutually neutralized and the effect of the mixture is attenuated.##

04600

J. J. Bonica

TREATMENT OF THE ACUTE RESPIRATORY DISTRESS SYNDROME WITH PROLONGED RESPIRATORY THERAPY AND NITROUS OXIDE (ANNUAL PROGRESS REPT.). Washington Univ., Seattle, Dept. of Anestheiology. Oct. 15, 1964. 18 pp.
DDC: AD 450 380

Clinical investigation into the frequency, etiology, and therapy of the Acute Respiratory Distress Syndrome, particularly that following cardiopulmonary bypass procedures, revealed that the appearance of the syndrome is related to the duration of the bypass, the degree of hemolysis, certain forms of hypoxia, and the use of hypothermia. Current therapy at this institution is directed toward combatting the severe atelectatic tendency of the lungs with respiratory volumes and rates which far exceed the "normal" respiratory requirements. Nitrous oxide has been administered to twenty patients for lengths of time varying from twenty-four hours to five days to provide analgesia and anmesia for the period of respiratory care without observing the detrimental side effects reported by other authors. (Author abstract)##

04698

S. D. Murphy

MECHANISM OF THE EFFECT OF ACROLEIN ON RAT LIVER ENZYMES. Toxicol. Appl. Pharmocol. 7 (6) 833-43, Nov. 1965. (Presented in part at the Third Annual Meeting, Society of Toxicology, Williamsburg, Va., Mar. 9-11, 1964.)

Liver alkaline phosphatase and tyrosine-a-ketoglutarate transaminase activities were markedly increased in rats at 5-12 hours after injection or inhalation of acrolein. These effects could be prevented or substantially reduced by prior adrenalectomy or hypophysectomy or by pretreatment of the animals with chemicals which inhibit protein synthesis. The data suggest that the irritant action of acrolein stimulates the pituitary-adrenal system, leading to hypersecretion of glucocorticoids which act to induce or stimulate the sythesis of increased amounts of the enzyme proteins by the liver.##

04964

S. N. Rokaw and F. Massey

AIR POLLUTION AND CHRONIC RESPIRATORY DISEASE. Am. Rev. Respirat. Diseases 86, (5) 703-4, Nov. 1962. (Presented at the Fifth California Air Pollution Medical Research Conference, Los Angeles, Dec. 4, 1961.)

This report summarizes 18 months of a longitudinal study of the effects of environmental variables on pulmonary function in a relatively stable group of severely involved, chronic respiratory patients. Concurrently, a partial study of pulmonary responses to environment was made in subjects with no known respiratory impairments, selected from hospital personnel. The study was conducted at the Rancho Los Amigos Hospital, a chronic disease center for the County of Los Angeles. The data resulting from the studies of the patients and collected from the environmental monitoring equipment were validated and transmitted for biostatistical analysis at the Western Data Processing Center. Programing designed for the IBM 7090 was employed. Methods of combinatorial analysis and multiple regression were employed to detect relationships between the observed variations in pulmonary function test results and the conditions at the time of and during various periods preceding the time of testing, i.e., 24, 48, or 82 hours prior time blocks.##

04966L

AIR QUALITY CRITERIA FOR THE PHOTOCHEMICAL OXIDANTS. Public Health Service, Washington, D.C., Division of Air Pollution. Sept. 1966. 276 pp.

This document surveys published (and about to be published) scientific information on the occurrence of photochemical oxidants in polluted air and the effects of those oxidants on various receptors. On the basis of this survey, criteria are presented for the informational use of municipal, State, and interstate air pollution control agencies. The sources of the photochemical oxidants, methods of measurements, and typical atmospheric concentrations in various communities are described. Current information on the relationship between the photochemical oxidants and eye irritation and other effects on humans, various effects on animals and plants, effects on materials, and effects on visibility (haze formation) are summarized. This review includes results of both laboratory studies and ambient air exposure studies, and, for man, the results of industrial and experimental exposures and the findings of clinical and epidemiological studies. Tables summarize the reported effects of ambient photochemical smog. Supplemental data are provided to cover the effects of pure ozone or peroxyacyl nitrates--both important atmospheric photochemical oxidants--on plants, animals, and humans exposed in laboratory studies by various investigators. A bibliography at the end of the document lists the important references reviewed in its preparation. (Author introduction modified)##

04981

R. A. Kehoe

AIR POLLUTION AND COMMUNITY HEALTH. Proc. Natl. Air Pollution Symp., 1st, Pasadena, Calif., 1949. pp. 115-20.

The nature and extent of the effects of industrial air pollutants upon health are matters for speculation. The facts that can be brought to bear upon the subject are derived from three principal sources. The first source is the literature of industrial toxicology, industrial medicine, and industrial hygiene. It may be generalized that a systematic study of the composition of the atmosphere of working places and concurrent clinical study of relevant groups of workmen has yielded the most pertinent information available as to the effects of specific industrial products upon health. The second source of information is the occurrence of air pollution episodes; each of these incidents, in so far as they have been subjected to investigation has yielded information. A third source of information has been that of the statistical correlation of trends in the incidence of carious diseases, with trends in atmospheric pollution. The apparently significant and relevant facts derived from these three sources are discussed.##

05176

L. G. Wayne

THE CHEMISTRY OF URBAN ATMOSPHERES (TECHNICAL PROGRESS REPORT-VOLUME III). Los Angeles County Air Pollution District, Calif. Dec. 1962. 223 pp.

A major part of the research conducted by the Los Angeles County Air Pollution Control District has been concerned with the effects of fuel composition on smog, potencies of various compounds as precursors of eye irritation, identification and study of reaction products in photochemical systems, and plant bioassay of polluted atmospheres. These studies have been supplemented by research projects of other institutions. The objectives, methods, and findings of such recent research in smog chemistry comprise the subject matter of the following chapters. The status of research dealing with eye irritation as a manifestation of photochemical smog, including some discussion of the biometric concepts involved in the measurement of eye irritation are discussed in Chapter 2. Various suggestions as to the chemical identity of the eye irritants are critically considered. Harmful effects of smog on plants are discussed in Chapter 3. Participation of various primary and secondary contaminants in the photochemical reactions in smog is studied in Chapter 4. Detailed consideration is given to the light-absorbing characteristics of primary pollutants and the chemical consequences of light absorption. Evidence about the development of photochemical products as secondary pollutants is critically reviewed, with special attention to the role and identity of a unique class of compounds, first discovered in the course of smog research, known originally as "Compound X". A reaction catalogue has been compiled (Chapter 5) listing the elementary reactions known or suspected to be important in the development of photochemical smog. The experimental evidence regarding the importance of airborne particulate matter in the chemistry of air pollution is reviewed in Chapter 6.##

05295

D. M. Pace, J. P. Thompson, B. T. Aftonomos, and H. G. O. Holck

THE EFFECTS OF NO2 AND SALTS OF NO2 UPON ESTABLISHED CELL LINES . Can J. Biochem. Physiol. (Ottawa) 39, 1247-55, 1961.

The effects of several concentrations of NO2, NaNO3, and NaNO2 respectively, upon strain L, mouse liver cells, and HeLa cells, were studied and a modified system designed to permit continuous exposure of cells to air pollutants is described. In NCTC medium 109 containing serum, cells tolerate concentrations of NO2 up to 4100 p.p.m. and some may even tolerate 8600 p.p.m. Removal of the serum lowers the lethal concentration of NO2 to less than 100 p.p.m. If the cells were covered only by a thin film of BSS (balanced salt solution) medium, a concentration of 100 p.p.m. NO2 proved toxic within 1/2 hour. If, however, the NO2 concentration was reduced to 5 or 10 p.p.m., cells survived a daily 8-hour exposure but many, if not most, of the cells were dead after several days. The presence of as little as 25 mg% NaNO2 retarded proliferation. On the other hand, NaNO3 was tolerated well in the three cell lines tested; HeLa cells seemed to be the most sensitive of the cell strains with respect to these salts. (Author abstract)##

05391

Saric, M.

OCCUPATIONAL EXPOSURE AS A FACTOR IN RESPIRATORY IMPAIRMENT. Arhiv. Hig. Rada Toksikol (Yugoslavia). 14, 327-60, 1963.

A review of the literature data on the effect of specific substances - common in industry as environmental pollutants - upon respiratory organs is presented. Included are such topics as respiratory diseases caused by gases, vapors and mist, the physiological action of irritating chemicals, and occupational lung cancer. Chronic bronchitis in industry is discussed separately, especially from the point of view of long-term effects of irritant gases and inert dust exposure. A part of the review relates to the diagnostic problems of bronchitis, as well as to the study of the so-called obstructive ventilatory diseases of the lung in relation to occupation.

05814

M. Sherman

TOXICITY OF NITROGEN OXIDES (WITH SUGGESTIONS FOR FURTHER RESEARCH). Preprint. (1961).

A general survey of the known facts and suggestions for further research are included. The topics discussed are nitric oxide, nitrogen dioxide, acute and chronic toxicity, pathologic features, studies of eye irritation, and nitrogen pentoxide. Considerations for future research include: acute and toxicity studies, effect of concentration and time, and nitrogen oxides with other smog components.##

05819

Schuck, E. A. and N. A. Renzetti

EYE IRRITATIONS FORMED DURING PHOTOOXIDATION OF HYDROCARBONS IN THE PRESENCE OF OXIDES OF NITROGEN. (J. Air Pollution Control Assoc.) 10 (1), 389-92 (Oct. 1960). (Presented at the 53rd Annual Conference, Air Pollution Control Association, Cincinnati, Ohio, May 22-26, 1960.)

Individual hydrocarbons were irradiated with near-ultraviolet light in the presence of nitrogen dioxide. Two products of the photooxidations, formaldehyde and acrolein, were found to be eye irritents and to account for the majority of the observed eye irritation found in the photooxidized systems studied. At the concentrations present in the photooxidized mixtures, epoxides, most aldehydes, ketones, nitrites, ketene, ozone, alkyl nitrates, and acyl nitrates were not eye irritants. Terminal olefins in general led to the greatest amounts of irritation. Internal olefins were of lesser importance in the formation of eye irritants in spite of their rapid rates of reaction. Saturates did not contribute to eye irritation because of their slow rates of reaction. (Author summary modified)

05882

THE HEALTH HAZARDS OF COMMUNITY AIR POLLUTION. (Senate Committee on Public Works, Washington, D.C., Subcommittee on Air and Water Pollution, June 7, 1966.) 64 pp.

In testimony before the Senate Special Subcommittee on Air and Water Pollution on June 7, 1966, the Secretary of Health, Education, and Welfare said: "There is no doubt that air pollution is a contributing factor to the rising incidence of chronic respiratory diseases - lung cancer, emphysema, bronchitis, and asthma." This summary of the results of scientific studies of air pollution and human health provides documentation of the Secretary's statement. The topics covered are: lung cancer, chronic bronchitis (and associated respiratory diseases), effects on laboratory animals, radioactibe materials, sulfur oxides, carbon monoxide, oxides of nitrogen and other facets of the ill effects of air pollution. There are one hundred sixty one (161) references.##

06048

M. C. Battigelli, F. Hengstenberg, R. J. Mannella, and A. P. Thomas

MUCOCILIARY ACTIVITY. Arch. Environ. Health 12(4):460-466 (April 1966). (Presented at the 30th Annual Meeting, Industrial Hygiene Foundation, Pittsburgh, Pa., Oct. 20-21, 1965.)

The mucociliary activity of respiratory epithelia, although well known over many years, has only quite recently assumed new importance, being recognized as one of the basic functions that the respiratory apparatus applies in responding to unfavorable environments. Physical, chemical, and biological "noxae" have been studied in their effects on the mucociliary activity of lower animals, mammals, and in man as well, with techniques that have proved accurate and reproducible. In this paper a brief review is given of these methods and of the results of investigations particularly related to the effects of air pollutants. Results of investigations on the effect of diluted diesel exhaust on the tracheal escalator of rats are summarized. An important finding is that exhaust dilutions that are without measurable effect on the respiratory resistance of human subjects are actually able to induce changes in tracheal clearance in some of the animals exposed for prolonged duration. With higher levels of exposure tracheal clearance of small mammals is affected with greater frequency. The removal of animals from the exposure invariably restores the original level of activity within a few days. The particulate content of the exhaust appears to play an important role in this type of respiratory injury. (Authors' summary)##

06053

W. C. Cooper and I. R. Tabershaw

BIOLOGIC EFFECTS OF NITROGEN DIOXIDE IN RELATION TO AIR QUALITY STANDARDS. Arch. Environ. Health 12(4):522-530 (Apr. 1966).

Data on the biological effects of nitrogen dioxide on man and lower animals over a wide range of concentrations is reviewed and tabulated. Present evidence suggests that long-continued exposures should not exceed the range 0.5 ppm to 1.0 ppm. This is based on the evidence of increased mortality in lower animals exposed to aerosolized micro-organisms after NO2 exposures and the pathologic effects demonstrable in animals continuously exposed to levels in the range of 4.0 ppm to 5.0 ppm. Brief exposures of a general population should not exceed 3 ppm over a period of 1 hr. This is based on the possible potentiation of infections and on the odor threshold. The recommendations relate to the possible effects of NO2 on health alone. They do not consider potentiation or additive effects nor any contributions to plant damage and visibility. (Authors' summary modified)##

06099

R. J. Bryan

INSTRUMENTATION FOR AN AMBIENT AIR ANIMAL EXPOSURE PROJECT. J. Air Pollution Control Assoc. 13 (6), 254-65, June 1963. (Presented at the 55th Annual Meeting, Air Pollution Control Association, Chicago, Ill., May 20-24, 1962.)

A comprehensive physiological study on the problem of air pollution from automobile exhaust was started by the University of Southern California under a contract with the U.S. Public Health Service. Several different types of experimental animals, including mice, rats, guinea pigs, and rabbits, were to be exposed at four separate locations in the Los Angeles Basin. In determining the possible biological effects of automobile-related air pollution on test aniamals, the planned studies included those for cancer, lung function, blood analysis, enzyme determinations, and tissue tests. The animals were divided into 2 groups, one being supplied untreated ambient air, and the other purified air for a control. All other environmental conditions were designed to be as nearly identical as possible. The design of facilities, including ambient air room ventilation and control room air purification systems, is discussed. In the design of facilities, the most important problem encountered was that of existing limitations on air purification systems. The experimental design concept used in this project called for no alteration of the breathing air provided to control animals except for the removal of air contaminants. It was not possible to provide such a system in which removal of CO, lower molecular weight hydrocarbons, and NO, could be accomplished effectively. Experience to date, however, indicates that the air purification system selected does remove O3, higher molecular weight hydrocarbons, NO2, and filterable black aerosols quite effectively. The conclusions to date are limited. However, it is concluded that additional design and evaluation projects are necessary in order to improve ventilation and air purification equipment design for environmental exposure projects.##

06201

Steadman, B. I., R. A. Jones, D. E. Rector, and J. Siegel

EFFECTS ON EXPERIMENTAL ANIMALS OF LONG-TERM CONTINUOUS INHALATION OF NITROGEN DIOXIDE. Toxicol. Appl. Pharmacol. 9 (1), 160-70 (July 1966).

One preliminary acute 8-hour study at a concentration of 123 mg/cu m of nitrogen dioxide, and one 30-day repeated study at a level of 67 mg/cu m were conducted. Both exposures produced marked lung irritation and high mortality in all species. The gross pathologic findings in the lungs of surviving animals indicated hemorrhagic pulmonary edema in the 123 mg/cu m study, and vascular congestionand focal hemorrhage in the 67 mg/cu m study. Five 90-day continuous studies were run at 0.9, 1.0, 9.2, 21.3, and 21.6 mg/cum of nitrogen dioxide. Except for a possible slight weight loss, there were no effects noted at 0.9 and 1.0 mg/cu m. At 9.2 mg/cu m there was a significant increase of mortality in guinea pigs and rabbits, and at the 21.3 and 21.6 mg/cu m levels there was a significant increase in mortality in all species except the dog. Minimal pathologic lung changes were seen at the highest concentrations. Cumulative 30-, 60-, and 90-day mortality data for the continuous exposure studies indicate that one cannot safely extrapolate from the 30-day results to anticipate the effects which may occur after 90 days. Care should also be taken in extrapolating continuous-exposure guidelines from data obtained in repeated-exposure studies. It is believed that the submarine guideline of 0.5 ppm (0.9 mg/cu m) will not cause any untoward effects in personnel exposed continuously for 60 days. The choice of analytical procedure is critical in measuring the concentration to which animals are exposed. Absorption of samples in 0.1 N NaOH is not satisfactory. Absorption directly into the nitriting reagent is the method of choice. (Authors| summary)

06264

A. P. Krueger

AIR IONS AND PHYSIOLOGICAL FUNCTION. J. Gen. Physiol. 45(4), 233-41 (Mar. 1962).

Studies on air ions and physiological function were designed to determine air ion effects on bacteria and the mammalian trachea. In bacteria, the only clear-cut action attributable to air ions was an increase in the rate of death. Observations on excised tracheal strips and on exposed tracheas of anesthetized rabbits, mice, rats, guinea pigs, and monkeys indicated that positive ions produce: (a) decreased ciliary activity, (b) contracture of the posterior tracheal wall, (c) exaggerated vulnerability to trauma, (d) vasoconstriction, and (e) increased rate of respiration. All five effects are seen in the anesthetized tracheotomized animal and the first three are seen in the isolated strip. In studies of gaseous ion effects on the catalytic activity of a modified Keilin-Hartree pig heart homogenate, we found that oxygen anions have a direct effect on cytochrome oxidase and accelerate the cytochrome-linked conversion of succinate to fumarate. This would suggest that the same action may produce a cytochrome-linked oxidation of 5-HT.##

06341L

W. B. House

TOLERANCE CRITERIA FOR CONTINUOUS INHALATION EXPOSURE TO TOXIC MATERIALS (III. EFFECTS ON ANIMALS OF 90-DAY EXPOSURE TO HYDRAZINE, UNSYMMETRICAL DIMETHYLHYDRAZINE (UDMH), DECABORANE, AND NITROGEN DIOXIDE). Midwest Research Inst., Kansas City, Mo. (Feb. 1964). 92 pp. (Technical Rept. ASD-TR-61-519 (III)
DDD: AD 440275L

Monkeys, rats, and mice were exposed for 90 days to: (a) hydrazine (1.0 ppm), (b) unsymmetrical dimethylhydrazine (UDMH) (0.5 ppm), (c) decaborane (0.05 ppm), and (d) nitrogen dioxide (5.0 ppm), to determine the inhalation toxicity of these agents after continuous exposure. Mortality was high among the animals exposed to hydrazine and decaborane, whereas the losses of animals exposed to UDMH and nitrogen dioxide were relatively low. All three species exposed to hydrazine developed fatty changes in the liver. In addition, rats and mice had lung lesion. Liver degeneration was involved in monkeys exposed to UDMH, whereas kidney and heart lesions were predominant in rats, and brown pigments, probably hemosiderin, were deposited in the liver of mice. Monkeys on decaborane exhibited fatty changes in the liver and occasional involvement of the kidney and heart. The most marked pulmonary lesions in rats were found in those exposed to decaborane, and lung involvement was also prevalent in mice. The least pathological changes were observed in animals on nitrogen dioxide. Monkeys showed liver degeneration occasionally, whereas both rats and mice had lung lesions. No trace of any of the test compounds was found in the blood of monkeys. Mite infestation of the lung, prevalent among controls as well as treated monkeys, masked possible lesions in this organ which may have been caused by any of the four chemicals. Changes in physiological state of animals as determined by clinical laboratory evaluations, including functional tests and/or hematology, blood chemistry and urinalysis, were relatively few in number. (Author abstract)##

06600

Bils, R. F. and J. C. Romanovsky

ULTRASTRUCTURAL ALTERATIONS OF ALVEOLAR TISSUE OF MICE. II. SYNTHETIC PHOTOCHEMICAL SMOG. Arch. Environ. Health, 14(6): 844-858, June 1967. 15 refs.

The possibility of using artificial photochemical smog was investigated. Male A-strain mice were exposed for three hours to previously irradiated synthetic atmospheres which initially contained propylene, nitric oxide, carbon monoxide, and water vapor to simulate the oxidant concentration produced during a heavy smog peak. The lungs of these treated mice showed a pattern of ultrastructural alterations of alveolar tissue similar to that of tissues in heavy natural smog. Wall cell lamellar bodies generally increased in size and number in exposed 8-month-old mice, but only temporarily. Delaying death only 12 hours allowed the lungs to return to normal. Some permanent changes seemed to occur in exposed respiratory tissue of 15-month-old mice. Reasonably good recovery of smog-disrupted alveolar and capillary lining cells took place, but few wall cells remained. More extensive disorganization of wall cell cytoplasm and disruption of lining membranes occurred when the 20-month-old mice breathed the synthetic smog and delayed death allowed further damage and revealed cell debris in the alveoli. Since the synthetic smog produces cytological effects similar to the heavy Los Angeles smog, it may prove to be a useful tool in further studies concerning the effects of photochemical smog on biological systems.

06640

M. C. Battigelli, R. J. Mannella, and T. F. Hatch

ENVIRONMENTAL AND CLINICAL INVESTIGATION OF WORKMEN EXPOSED TO DIESEL EXHAUST IN RAILROAD ENGINE HOUSES. Ind. Med. Surg., 33, 121-4 (Mar. 1964).

Within the limits of exposure to diesel exhaust products of locomotive repairmen in three representative railroad engine houses over a period up to 15 years (average duration of 10 years), 210 workers (average age -- 50 years) did not show any significant difference in pulmonary function performance from a group of 154 railroad yard workers (average age -- 50 years) of comparable job status but without history of exposure to diesel exhaust products. Environmental studies in two engine houses revealed levels of exposure to several known constituents of diesel exhaust which were well within the tolerable limits of these substances considered as separate agents. These low values support the negative medical and physiological findings. In contrast, this investigation suggests higher frequency of respiratory complaints, physical examination of abnormalities of the chest, and decreased pulmonary function and performance of cigarette smokers compared to non-smokers regardless of occupation. (Authors' summary)##

06675

Z. Ya. Lindberg

EFFECT OF SUPERPHOSPHATE PRODUCTION DISCHARGES ON CHILDREN'S HEALTH . U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 7, 284-8, 1962. (Gigiena i Sanit.,) 25 (5), 89-96 (1960). Russ. (Tr.)
CFSTI: 62-11103

In order to assess the possible health effects of emissions from a superphosphate plant, the frequency of upper respiratory illness was studied in 2053 children. Of this total, 1375 children lived in the vicinity of the plant and 678 were controls. Air samples were taken in the inhabited zones around the plant at distances of 500 and 3000 meters. The concentrations in excess of allowable limits are given for SO2, H2SO4, F, and NOx. Most of the children involved in the study were given either x-ray or fluoroscopic chest examinations. The results of these examinations were correlated with tuberculin skin tests. The data indicated that children residing in the area of the superphosphate plant had a higher frequency of both upper respiratory ailments and tuberculosis.##

06689

Sterling, T. D., S. V. Pollack, and J. J. Phair

URBAN HOSPITAL MORBIDITY AND AIR POLLUTION. (A SECOND REPORT.) Arch. Environ. Health, 15(3):362-374, Sept. 1967. 3 refs.

This analysis deals with morbidity as indicated by the length of stay in the hospital of admitted patients. Length of stay represents a measure of severity of illness which might be more indicative of stresses encountered than admission rate in itself. Also, responsiveness of a hospital patient to a particular pollutant can be related meaningfully especially if the latter is measured in close proximity to the place of confinement. This method may be more sensitive than studying hospitalized cases coming from various areas of the city, albeit that the service areas of individual hospitals have a tendency to be fairly restricted and specific. The investigators were given access to large data-sets in Cincinnati, Ohio and Los Angeles, California. The data were in such a form that they could readily and cheaply be processed by automatic data equipment. The Cincinnati data recorded accorded them the opportunity to test out some of their hypotheses on a relatively small volume of data. Additionally, they were able to develop the relevant computer techniques and programs. The acquired facility in understanding and technique was then applied to the more voluminous Los Angeles data. Thisreport concerns itself with the analysis of the relation between air pollution and length of stay of patients in the larger Los Angeles hospitals serving Blue Cross admissions.##

06717

Wagner, W. D., B. R. Duncan, P. G. Wright, and H. E. Stokinger

EXPERIMENTAL STUDY OF THRESHOLD LIMIT OF NO2. Arch. Environ. Health, 10(3):455-466, March 1965. 34 refs. (Presented at the Annual Meeting, American Industrial Hygiene Assoc., Washington, D.C., May 17, 1962.)

In an attempt to provide information on long-term nitrogen dioxide toxicity, three chronic animal studies that both included and bracketed the present threshold limit of 5 ppm were performed. Six species of laboratory animals (dog, rabbit, guinea pig, rat, hamster, mouse) were exposed daily for periods up to 18 months to pure nitrogen dioxide at closely controlled concentrations of 5 ppm, the present threshold limit, and levels one fifth as high, 1 ppm, and five times greater, 25 ppm. Control groups were used throughout the studies. At no exposure level did changes in body weight, hematologic values, or biochemical indices deviate significantly from the control data. Studies with a spontaneous pulmonary tumor-susceptible strain of mice suggested, under these conditions of exposure, a possible tumorigenic accelerating capacity for NO2. Respiratory function test results on exposed rabbits were equivalent to the controls, with the exception of the 25 ppm group, which indicated a slight and transitory elevation in mean O2 consumption. Tolerance in aging rats and mice to acute lethal effects of NO2, following extended periods of development from exposure at 5 ppm and 25 ppm, was achieved to a significant degree. Detailed histologic evaluation of tissues of serially sacrificed exposed animals and their controls presented no evidence, with any of the animal species used, that nitrogen dioxide, in the concentrations employed and in the duration of exposures, had any demonstrably morphologic effect on either production of pulmonary lesions or the susceptibility of the animals to a pulmonary inflammatory process. These data present reliable evidence for the present 5 ppm threshold limit value for nitrogen dioxide, with the added caution that 5 ppm should represent a ceiling on the basis of suggestive lung tumorigenesis.##

06745

G. P. Haydon, J. T. Davidson, G. A. Lillington, and K. Wasserman

NITROGEN DIOXIDE-INDUCED EMPHYSEMA IN RABBITS. Am. Rev. Respirat. Diseases 95, (5) 797-805, May 1967.

A study was made of the pulmonary pathology in rabbits after exposure to an atmosphere containing 8-12 ppm of nitrogen dioxide. This work is an extension of similar work done with rats by Freeman et al. in which anatomic changes associated with emphysema developed with exposures to nitrogen dioxide at levels below those that cause acute pulmonary edema. Rabbits were continuously exposed to an atmosphere of 8-12 ppm of nitrogen dioxide for 3 to 4 months. Histopathological examination was made of the lungs of 18 rabbits that survived and of 3 rabbits who were allowed to recover for one week to a month. Irreversible destructive changes in the alveolar walls, accompanied by an abnormal enlargement of the distal air spaces were seen in the lungs of the exposed rabbits. The changes were compatible with diagnosis of emphysema. Reversible histopathologic changes in the bronchioles appeared to account for the increase in the non-elastic resistance measured in some of these rabbits. Two processes are postulated which might initiate the pulmonary emphysema. In one, the principal injury produces focal tissue necrosis in the alveolar walls that leads, perhaps, to elastic tissue destruction followed by abnormal enlargement of the peripheral air spaces. In the other, the principal injury causes a chronic airway obstruction, leading to hyperinflation of the lungs, which may be followed by tissue injury and various degrees of tissue disruption.##

06746

J. T. Davidson, G. A. Lillington, G. B. Haydon, and K. Wasserman

PHYSIOLOGIC CHANGES IN THE LUNGS OF RABBITS CONTINUOUSLY EXPOSED TO NITROGEN DIOXIDE. Am. Rev. Respirat. Diseases 95, (5) 790-6, May 1967.

Experiments were carried out to determine the effect of prolonged continuous exposure to 8-12 ppm of nitrogen dioxide on the pulmonary function in rabbits and to obtain a physiologic explanation of the nature of the lesion. Rabbits were exposed continuously to 8-12 ppm of nitrogen dioxide for 3-4 months. Pulmonary function studies were carried out on anesthetized controls and experimental animals studied 4 days to one month after the termination of the exposure. The functional residual capacity increased as did the nonelastic resistance. There was no significant change in the carbon dioxide tension. On removal from the exposure chamber, the physiologic changes were completely reversed. Pathologic studies suggest that the obstructive changes are caused by bronchiolitis. Destructive changes that persisted during the recovery period resemble emphysema, but were not sufficiently severe to have resulted in significant physiologic abnormality.##

07138

Yanysheva, N. Ya.

THE EFFECT OF ATMOSPHERIC AIR POLLUTION BY DISCHARGES FROM ELECTRIC POWER PLANTS AND CHEMICAL COMBINES ON THE HEALTH OF NEARBY INHABITANTS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 1:98-104, Jan. 1960. (Also published in Gigiena i Sanit., (8):15-20, 1957.) Translated from Russian.
CFSTI: TT 60-21049

A study was made of the effect of industrial discharges on the health of inhabitants of a large industrial center the atmospheric air of which was being polluted by the discharges of several production and manufacturing plants. A study was made of the degree of atmospheric air pollution with dust (fly ash), SO2, sulfuric acid aerosol, hydrogen sulfide, chlorine, nitrogen oxides, and phenol. Air samples were collected by the aspiration method under the smoke plume coming from smoke stacks at distances ranging from 200 to 2,500 meters from a chemical combine and an electric power plant, and up to 800 meters from a phenol producing plant. The morbidity rate in two villages in the industrial area and one village in a control area was studied. Pollution of the atmospheric air with dust (fly ash), sulfurous gas, hydrogen sulfide in concentrations many times above the allowable limits and of aerosols of sulfuric acid and chlorine in concentrations just above the allowable limits, as well as the oxides of nitrogen and phenol within the limits of allowable concentrations deleteriously affected the population's health. It was concluded that the above mentioned pollutants produced the following pathologic results: a) Increased by several times the frequency of occurrence among children and adults of diseases of the respiratory organs, of the nervous system, of the organs of vision and of the skin. b) Lowered the resistance of the population to such infectious disease as the grippe and angina. c) Induced in children a state of susceptibility to the development of rickets and anemia, and brought about early manifestations of diffuse pneumosclerosis in isolated cases.##

07162

B. G. Ferris, Jr. and N. R. Frank

AIR POLLUTION AND DISEASE. Anesthesiology 25(4):470-478 Aug. 1964.

Atmospheric pollution can be classified under three headings: general, occupational and personal. The components are complex and variable so that it is difficult to extrapolate the prevalence of disease in one area to that of another unless the two have similar chemical compositions. Significant exposures can occur at work and may produce impairment of respiratory function. It is emphasized that tobacco smoking, and particularly cigarette smoking, is a most important factor in the causation of chronic nonspecific respiratory disease. Much research has been done to elucidate the mechanism whereby such changes are induced but specific answers concerning the mechanisms have not been forthcoming. Tables are included showing types of atmospheric pollution; comparison of Los Angeles and London types of pollution; categories of airborne materials with selected examples that may occur in industry and that may cause disease; age standardized rates of respiratory diseases by tobacco usage and sex; age standardized rates (%) of respiratory disease by current cigarette smoking habits and sex.##

07173

D. Henschler, E. Hahn, and W. Assmann.

CONDITIONS FOR AN INCREASE IN TOLERANCE UPON REPEATED INHALATION OF IRRITATING GASES WHICH CAUSE PULMONARY EDEMA. ((Wirkungsbedingungen einer Toleranzsteigerung bei wiederholter Einatmung von Lungenodem erzeugenden Reizgasen.)) Arch. Exptl. Pathol. Pharmakol. Vol. 249:325-342 (Nov. 6, 1964). Ger.

Opinions are divergent concerning the effect of long-term inhalation of low concentrations of gases and aerosols which can cause pulmonary edema. This paper investigates the time relationships in the formation of increased tolerance to such gases, its duration, the influence of time and concentration, and the pathological-anatomical reaction of lung tissue to the preliminary treatment. After the protective mechanism was proved to be independent of the chemical structure of the irritant, NO2 was chosed as representative of the gases causing pulmonary edema. Most of the laboratory animals used were inbred mice of the CFW and NMRI families (Zentral-institut fur Versuchstierzucht, Hannover), which were brought into the test weighing 18-22 gm. Increased tolerance to high concentrations of NO2 was obtained by exposing the specimens to 40 ppm NO2 for one 6-hr period. The protection reaction first appears within 24 hr. Maximum protection occurs in 2-5 days and is largely gone after 10 days. Repeated preliminary exposure with the same concentrations at 4-day intervals does not increase the amount or duration of protection.##

07174

H. W. Schlipkoter and A. Brockhaus

TESTS ON THE EFFECT OF GASEOUS AIR POLLUTION ON THE DEPOSITION AND ELIMINATION OF INHALED DUSTS. ((Versuche uber den Einfluss gasformiger Luftverunreinigungen auf die Deposition und Elimination inhalierter Staube.)) ZBL Bakt. 191(12):339-344 Dec. 1963. Ger.

To be injurious to men, suspended particles in the atmosphere must be inhaled and deposited in the lungs. Only particles smaller than 5 microns and especially smaller than 1 micron can penetrate into deep sections of the lungs. Other important factors are the type and dissolvability of the dust as well as the volume and frequency of respiration. To determine the deposition of dust in lungs, it is necessary to determine the difference between the dust content of inhaled and exhaled air. A test conducted to determine the effect of gases found in large cities on the amount of dust deposited in lungs utilized a mixture of 2 types of soot with air which was sprayed and measured with a special apparatus. Spectrophotometric and quantitative methods were used to determine the amount of dust deposited in the lungs of test persons who respired at a rate of 1% breaths per minute, temperature of 23 deg. C, and a humidity of about 68%. Typical gases mixed with the test suspension in the dust chamber were SO2 and CO2 or NO2 in concentrations which correspond to the MAK values. An increase in dust deposition in the lungs was observed only when nitrogen gases were inhaled simultaneously. Further tests showed that the elimination of deposited dust from the lungs is hindered by SO2 and SO3.##

07191

G. D. Parbrook

EXPOSURE OF EXPERIMENTAL ANIMALS TO NITROUS-OXIDE-CONTAINING ATMOSPHERES. Brit. J. Anaesthesia (Altrincham), 39(2),114-8 (1967).

The results of exposures of experimental animals to atmospheres of nitrous oxide, nitrogen, and oxygen for prolonged periods in special ventilation units are reported. The animal cage is placed in a clear plastic bag and the atmosphere is recirculated through soda lime and activated charcoal with the water vapor being condensed out in a cold trap. Fresh gases are metered into the system from rotameters and the oxygen is maintained at 21 plus or minus 1.5%. Guinea pigs and rabbits were unsuitable for further study because of a weight loss of over 5% after 48-hr exposure to 60% nitrous oxide. Mice and rats were more satisfactory for prolonged nitrous treatment. In a series with mice the 60% nitrous oxide was associated with a 5% weight loss which was avoided in a series treated with 40% nitrous oxide for 6 days. The mouse appears to be the experimental animal of choice where it is essential to avoid any secondary effects from mild appetite reduction and slight weight loss.##

07240

Petr, B. and P. Schmidt

THE INFLUENCE OF THE ATMOSPHERE CONTAMINATED BY SULFUR DIOXIDE AND NITROUS GASES ON THE HEALTH OF CHILDREN. ((Der Einfluss der durch Schwefeldioxid und Nitrose Gase verunreinigten Atmosphare auf den Gesundheitszustand der Kinder.)) Translated from German. Z. Ges. Hyg. Grenzg. (Berlin), 13(1):34-38, Jan. 1967. 4 refs.

Evidence that sulfur dioxide and nitrogen gases which are effective in low concentrations also produce changes in the individual indicators of group diagnostics is demonstrated. Differentiation was made between effects on control groups and the group from the polluted atmosphere as well as between the influence of both the combined effect of sulfur dioxide and nitrogen peroxide and the effect of sulfur dioxide alone. The method of the erythrogram is also described. This method is based on the increase of the number of erythrocytes in children living in air-polluted areas. The methemoglobin level in the blood of children is significantly increased by the air pollution caused by nitrogen peroxide in the surrounding of large chemical works. Thus, another possible cause of the development of inapparent methemoglobinemia in school children between the ages of 8 to 10 is explained. (Authors' summary, modified)##

07541

P. Polu, P. Laurent, C. H. Guyotjeannin, D. Thin

AN OCCUPATIONAL DISEASE OF CHIMNEY SWEEPS CLEANING OIL-FIRED FURNACES. (Pathologie professionnelle des fumistes effectuant le ramonage des chaufferies a mazout.) Text in French. Arch. Maladies Profess. Med. Trav. Securite Social (Paris), 26(4-5):435-446, April-May 1967. 8 refs.

The frequent and consistent symptoms experienced by chimney sweeps cleaning oil-fired furnaces appear to present a new specific syndrome. Most of the efforts of industrial hygienists have been concentrated on the pollution in the air and not much has been done on the chemistry of soots. Findings, hypotheses as well as suggestions for control are presented. A table is given which compares the symptoms of the workers such as irritation of the eyes, the upper respiratory tract, the mouth, and skin as well as serious deterioration of their clothing. The men also complained of loss of appetite, nausea, vomiting, lack of coordination of movements, amnesia, and headache. In the same table in parallel columns are listed the symptoms of exposure to vanadium, sulfur dioxide, and oxides of nitrogen. Based on an examination of the soot involved it was concluded that the vanadium was not involved in the symptoms of the chimney sweeps and that the sulfur content of the fuel was an important factor. It is recommended that fuels low in sulfur be used, that the optimum combustion conditions be maintained by keeping the temperature of the flame down by a high excess of outside air. Electrostatic precipitators can cut the emission of SO3 by 50%. The injection of magnesia in the vicinity of the flame can neutralize the SO3< The use of industrial-type vacuum cleaners offers a method of furnace cleaning without an occupational exposure.##

07842

Lewis, T. R., F. G. Hueter, and K. A. Busch

IRRADIATED AUTOMOBILE EXHAUST. (ITS EFFECTS ON THE REPRODUCTION OF MICE,) Arch. Environ. Health, 15(1):26-35, July 1967. 20 refs.

This study attempts to define the relative importance of pre-exposure of each member of the sexual pair to irradiated auto exhaust, and exposure of the female partner and her litter, following removal of the male with regard to conception, fetal development, fecundity, and infant survival. There were 150 virgin female mice preconditioned to either filtered air or irradiated automobile exhaust for 46 days, who were randomly paired with 150 similarly preconditioned males. All mice were 12 to 13 weeks of age at the time of mating and were caged individually during the preconditioning period. Males and females were paired randomly to form approximately equal numbers of sexual pairs (18 or 19) in each of eight treatment groups. The experiment was repeated with a new population of mice of the same strain 15 days after completion of the first investigation. The adverse effects of pre-conditioning male mice with irradiated auto exhaust on conception, implantation of fertilized ova, fecundity, and infant survival appear to be induced by a common mechanism. This is the first experiment the results of which imply mutational effects on mammalian cells by components or subsequent products of irradiated auto exhaust. An effect of the alteration of one environmental factor in this investigation, i.e. atmospheres to which the females were exposed, was evidenced by mild stress on litter sizes. Litters born in an atmosphere of irradiated auto exhaust showed a marked increase in mortality in both experiments, but the magnitude differed.##

07847

Coffin, D. L., E. J. Blommer, D. E. Gardner, and R. Holzman

EFFECT OF AIR POLLUTION ON ALTERATION OF SUSCEPTIBILITY TO PULMONARY INFECTION. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((18))p., ((1967)). 20 refs.

Exposure to ozone, nitrogen dioxide, and artifical auto smog increases the susceptibility of mice to experimental infection by K. pneumoniae, Streptococcus, and D. pneumoniae. Minimal effective concentrations for 2- to 4-hour exposure are: 3.5 ppm for NO_2, 0.08 ppm for O_3, and 0.15 total oxidant for auto smog. The effect appears to be augmented by alterations of the environmental temperature; tolerance to ozone is manifested. Continuous exposure to 0.5 ppm NO_2 for 6 months produced similar results. Exposure to the pollutants results in increased survival time of aerosolized bacteria within the lungs, an effect also noted from treatment with cold, hypoxia, and alcohol. Studies of cells washed from the bronchial trees of rabbits exposed to ozone indicate that exposure is followed by an influx of polymorphonuclear leukocytes and a corresponding diminution of pulmonary alveolar macrophages. The latter cells also exhibited a reduced ability to phagocytize streptococci when the organisms were applied in vivo. (Authors' abstract)##

07936

Hernandez-Gutierrez, F.

AIR POLLUTION BY CARBON MONOXIDE. ((La polucion del aire por oxido de carbono.)) Text in Spanish. Anales Med. Cir. (Barcelona), 52(1):58-77, Jan. 1966.

In addition to a comprehensive review on the physiological effects and significance of CO pollution, the entire field of air pollution is reviewed. Data are given on the amounts of various pollutants and their effects on health and the economy. The amounts of pollutants discharged annually into the air in the City of Barcelona are: 600,000 tons of water vapor, 850,000 tons of CO_2, 80,000 tons of CO and 35,000 tons of SO_2. Snow which fell in 1962 and in 1965 indicated that the air over Barcelona in 24 hours contained between 390 and 580 tons of dust, 6 tons of nitrogen oxides, and 19.5 tons of SO_2 and SO_3. The average and maximum values of carbon monoxide in various cities are presented and in London range from an average of 1.8 ppm to a maximum during a smog of 200 ppm. In garages the concentration may be as high as 1.250 ppm and concentrations of 200 ppm are not uncommon. The various methods for measuring CO are outlined and control is discussed.##

08026

MacEwen, James D. and Robert P. Geckler

COMPARATIVE TOXICITY STUDIES ON ANIMALS EXPOSED CONTINUOUSLY FOR PERIODS UP TO 90 DAYS TO NO_2, O_3% AND CCl_4 IN AMBIENT AIR VS. 5 PSIA 100% OXYGEN ATMOSPHERE. In: Proc. 2nd Ann. Conference Atmospheric Contamination in Confined Spaces, 4 and 5 May 1966, Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio, Aerospace Medical Div., AMRL-TR-66-120. p. 238-257, Dec. 1966. 6 refs.
CFSTI, DDC: AD 646512

The data obtained from a 90-day continuous exposure of animals to the industrial threshold limit value (TLV) of NO_2, O_3 and CCl_4 are presented. Animal exposure facilities of the

Aerospace Medical Research Laboratories were used for the 90-day continuous experiments. The atmosphere compositions were 100% oxygen at 260 mm Hg pressure and air at either 820 (rho 02 = 154 mm Hg) or 740 mm Hg (rho 02 = 148 mm Hg) pressure. The data are unremarkable except for the deaths at 720 mm Hg pressure in the ozone exposures. Mice appear somewhat more sensitive to ozone than the other species. Guinea pigs also showed mortality upon exposure to ozone, which was the only material to which this species was exposed. Note that most of the deaths occurred during the first half of the 90-day exposure suggesting some degree of adaptation in the survivors. The data are consistent with the hypothesis that the animals first respond to the atmospheric contaminant and then adapt to the changed environment. The data do not, however, reveal significant differences between those animals exposed to contaminants at reduced pressure in 100% oxygen and those exposed at normal atmospheric pressure (740 mm Hg). With respect to the clinical data, although the values of serum enzymes of exposed animals were different from the control values, no adverse effects on the experimental animals were noted. It appears clear that the TLV for space applications may not be radically different from industrial TLV if only the factors of continuous dosage, reduced pressure, and pure oxygen atmosphere are considered.##

08027

Patrick, R. L.

PATHOLOGICAL EFFECTS OF EXPOSURE TO PULMONARY IRRITANTS AT AMBIENT AIR VS. 5 PSIA 100% OXYGEN ATMOSPHERE FOR PERIODS UP TO 90 DAYS. In: Proc. 2nd Ann. Conference Atmospheric Contamination Confined Spaces, 4 and 5 May 1966, Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio, Aerospace Medical Div., AMRL-TR-66-120, p. 260-262, Dec. 1966.
CFSTI, DDC: AD646512

A study to compare the toxic effects of contaminants under conditions of 5 psia (pounds per square inch, absolute) and 100% oxygen and under normal atmospheric conditions is described. Mortality and pathologic alterations were evaluated in monkeys, rats, and dogs exposed continuously to various concentrations of nitrogen dioxide and ozone for 14 days. Animals were exposed to these compounds, sacrificed, and examined grossly at the Toxic Hazards Research Unit. Tissues were sent to the Laboratory for Experimental Biology to be examined microscopically. All three species exposed to two concentrations of NO2 and ozone showed greater mortality at ambient conditions that at altitude. Animals dying early showed similar changes under both conditions. Survivors of each group showed similar changes except in isolated instances. Alveolar hemorrhage and edema were the most prominent changes associated with early death. It would seem that 5 psiz, 100% oxygen offered some degree of protection against alveolar hemorrhage and edema. In some groups inflammatory changes were more marked under altitude conditions; however, this is thought to reflect the longer survival of this group.##

08052

Fink, B. R., T. H. Shepard, and R. J. Blandau

TERATOGENIC ACTIVITY OF NITROUS OXIDE. Nature (London), 214(5084):146-148, April 8, 1967. 18 refs.

Exposure of pregnant rats to an atmosphere containing 45 to 50 percent nitrous oxide resulted in foetuses with abnormalities of vertebrae and ribs, and in death and resorption of foetuses. The lethal effects seemed to be selective, for surviving foetuses showed a smaller male/female sex ratio than did the controls. Species differences, and the long duration of the reported experiments, prevent any extrapolation to clinical conditions. However the rat and man are similar enough in the susceptibility of their nervous and haemopoietic systems to depression by nitrous oxide to raise the question of a similar vulnerability in respect to congenital malformations.

08054

Gross, Paul, William E. Rinehart, and Robert T. P. deTreville

THE PULMONARY REACTIONS TO TOXIC GASES. Am. Ind. Hyg. Assoc. J., 28(4):315-321, July-Aug. 1967. 8 refs. (Presented at the Annual Meeting, American Industrial Hygiene Assoc., Chicago, Ill., May 1-15, 1967.)

The deep pulmonary response to toxic gases depends upon which of the two components of the alveolar wall is responding, the capillary or the alveolar membrane. Injury to the capillary results in pulmonary edema or bronchopneumonia, whereas a dose of irritant injuring substantially only the alveolar membrane causes the latter to respond with the development of a multi-layered cell mass that is supported by argyrophilic fibers. Because collagenization of this stroma does not usually occur, such septal lesions caused by noxious gases resolve. The respiratory bronchiole is the site of predilection of lesions caused by deep lung irritants because of delayed clearance in this region. (Authors' abstract)##

08234

DISCUSSION ON RESPIRATORY DISEASE AND POLLUTANT EXPOSURES. II. LABORATORY RELATIONSHIPS. Arch. Environ. Health, Vol. 8, p. 147-152, Jan. 1964.

A discussion on the laboratory relationships of respiratory disease and pollutant exposures is presented. Latex agglutination text in NO2 exposed animals, relationship between skin sensitivity and sensitivity of the bronchial mucosa, and mechanism of action in chronic lung disease are discussed.##

08238

DISCUSSION ON RESPIRATORY DISEASE AND POLLUTANT EXPOSURES. I. LABORATORY RELATIONSHIPS. Arch. Environ. Health, Vol. 8, p. 129-131, Jan. 1964.

A discussion on the laboratory relationships of respiratory disease and pollutant exposures is presented. The fate of the reabsorbed carbon in these animals exposed to inhalation of carbon alone, effects on circulation of exposure to NO2 plus carbon, differences in circulation with different sized carbon particles, mechanism material and the possibility of using carbons from different sources are discussed.

08403

Hamming, Walter J. and Robert D. MacPhee

RELATIONSHIP OF NITROGEN OXIDES IN AUTO EXHAUST TO EYE IRRITATION--FURTHER RESULTS OF CHAMBER STUDIES. Atmos. Environ., 1(5):577-584, Sept. 1967 10 refs.

Two 1100 cu ft environmental chambers were utilized for irradiation of low concentrations of auto exhaust under static conditions. The chambers were constructed of glass panels with aluminum frames. Artificial lights were used. Eye irritation was determined by human panels at various times during the irradiations. Two irritation maxima occurred during a static test. The first peak has not been correlated with any functions of the reactants or products. However, the second eye irritation peak is shown in this paper to be related to several entities, among which is the NOx defect. (Authors' abstract)##

08423

Gross, Paul, Robert T. P. deTreville, Mary A. Babyak, Marianne Kaschak, and Ethel B. Tolker

EXPERIMENTAL EMPHYSEMA. EFFECT OF CHRONIC NITROGEN DIOXIDE EXPOSURE AND PAPAIN ON NORMAL AND PNEUMOCONIOTIC LUNGS. Arch. Environ. Health, 16(1):51-58, Jan. 1968. 7 refs.

The extent to which pneumoconiosis may determine or affect the development of emphysema in small animals was investigated. Quartz, coal, and blast furnace dusts were injected intratracheally into hamsters, guinea pigs, and rats. One group of animals was pastured for two weeks and another group for 10 weeks. Animals from the latter group were injected intratracheally with papain. Both groups were then exposed for one year (two hours per day) to concentrations of nitrogen dioxide (NO2) ranging on an average from 22 to 74 ppm. In guinea pigs this exposure resulted in multiple small foci of emphysema with a prevalence of only 15%. More animals without pneumoconiosis developed this emphysema than did animals with pneumoconiosis. Hamsters also developed emphysema, but this is believed to have been spontaneous because more animals not exposed to NO2 developed emphysema than those exposed. In the hamsters as in the guinea pigs, the emphysema was found predominantly in tissue unaffected by dust. Intratracheal injections of papain caused weight loss or reduction in weight gain in control animals. In pneumoconiotic animals, this effect of papain was less marked. Also, pneumoconiotic animals appeared to have less severe emphysema than the control. Pneumoconiotic foci in lungs do not determine the location of emphysema whether experimentally produced (guinea pigs, rats, and hamsters) or naturally occurring (hamsters). Chronic exposures to NO_2 had no accelerating or collagenizing effect on experimental silicosis or on the pneumoconioses caused by coal or blast furnace stack dust.##

08424

Hackney, Jack D., Bils, Robert F., Evans, Michael J., and Rounds, Donald E.

FUNCTIONAL AND MORPHOLOGICAL RESPONSE OF IN VITRO LUNG AND MYOCARDIAL TEST OBJECTS TO EXPERIMENTAL GAS ENVIRONMENTS. J. Air Pollution Control Assoc., 18(1):9-11, Jan. 1968. 7 refs. (Presented at the 60th Annual Meeting of the Air Pollution Control Association, Cleveland, Ohio, June 11-16, 1967.)

Innovations in the use of lung and myocardial tissue in vitro have permitted continuous morphological observation of cells treated with a controlled gaseoue environment. The mammalian tissues are covered with a dialysis membrane and cultured in a Rose chamber containing a large gas phase. Test gases can be flushed continuously through two hypodermic needles in the culture chamber wall. Rabbit lung tissue was cultured in the Rose chamber and exposed to $NaNO_2$ concentrations which were adjusted to be equivalent to NO_2 gas. The use of $NaNO_2$ was decided upon to facilitate the introduction of NO_2 to the cells. Cell types could be recognized for 5 days or more in electron microscopic preparations. After 1 day of exposure to 40 ppm NO_2, swelling and blebbing of the surface of the epithelial cells was seen; none was found in the control. More extensive involvement was apparent after 1-day exposure to 100 ppm, and after 3 days of exposure to40 ppm NO_2. The beating rate of myocardial cells was found to be an objective and convenient endpoint for testing the characteristics of the exposure system. A comparison of the response of cells in the gas phase with that of elements in the fluid phase within the same chamber suggested that this system can serve as a model for evaluating the effect of an increasing diffusion barrier.

08461

Il'nitskaya, A. V.

PROBLEMS OF OCCUPATIONAL HYGIENE AND HEALTH MEASURES IN PLASMA SPRAY-COATING OF METALS. ((Voprosy gigieny truda i ozdorovitelnye meropriyatiya pri plazmennom napylenii metallov.)) Text in Russian. Gigiena Truda i Prof. Zabolevaniya (Moscow), 10(7):21-27, July 1966. 7 refs.

Plasma spray coating of metals is accompanied by health hazards, such as high-frequency noise, the presence of aerosols, nitrous oxide, and ozone, as well as the ionization of air and ultraviolet radiation. The aerodynamic noise levels may attain 128-130 db. A special polyclinical and physiological examination of workers showed disturbed vascular tone with a tendency towards hypotension, slowed-down pulse and abnormal cardiac rhythm, as well as an increased threshold of auditory sensitivity by the end of the work day. Workers with a service record of 2-5 years exhibited impaired hearing with distorted perception of high-pitched tones. Recommendations are made for reducing the health hazards of operators. (Author's summary, modified)##

08570

Boren, Hollis G.

PATHOBIOLOGY OF AIR POLLUTANTS. Environ. Res. 1(2):178-197 Oct 1967. 100 refs.

Results of inhalation exposures of guinea pigs to carbon followed by NO2, or to NO2 followed by carbon, are presented to exemplify both specific and general problems inherent in using animal systems to determine injurious effects of environmental agents. Inhalation of carbon alone is followed by a macrophage response. Subsequent exposure to NO2 results in lung destruction. Inhalation of NO2 followed by carbon gives a macrophage response of lesser degree. These findings are interpreted to mean that the sequence of exposure may determine a given response. The limitations of this study indicate the necessity of using approaches which control or measure multiple biologic factors operative at different levels of organization of diverse animal systems. (Author#s abstract)

08801

Hogger, Dieter

EFFECTS OF THE MOTOR VEHICLE EXHAUST GASES ON HUMANS, ANIMALS AND PLANTS. ((Auswirkungen der Motorfahrzeugabgase auf Menschen, Tiere und Pflanzen.)) Text in German. Z. Praeventivmed., Vol. 11, p. 161-178, March-April, 1966. 20 refs.

The various toxic components in automobile exhaust gases are reviewed. To determine the amount of carbon monoxide inhaled by the population, the carbon monoxide hemoglobin content of 331 policemen and 597 automobile drivers was determined during a test for alcohol. The nonsmoking policemen did not exceed the 5% limit, but 25% of smoking policemen and 40% of the drivers did. The amount of lead in the street, in windowsill dust, and in the street air was well as in the blood of office workers, metal workers and garage workers was determined in Zurich between 1948-1963. While the amount of lead in the dust of the street, air, and window sills increased significantly by 1955, the amount found in the blood increased only slightly. Soot is considered deleterious as a carrier of other water soluble toxic substances into the lungs. The hygienic limit of 0.5 cc./cu m for oxides of nitrogen is only seldom exceeded. Sulfur dioxide emissions are negligible. Hydrocarbons and polycyclic hydrocarbon emissions from motor vehicles contribute only a few percent to the rise in lung cancer. The paraffin and olefin hydrocarbons are nontoxic to humans, animals and plants, while ethylene is highly toxic to plants. While in Europe oxidants do not contribute significantly to air pollution, compounds such as ozone and peroxyacylnitrite contribute to air pollution in tropic and subtropic climates with a high concentration of motor vehicle traffic, particularly under adverse meteorological conditions. The psychological problems caused by air pollution are discussed and it is concluded that the psychological effects cannot be dismissed lightly.##

08812

Muller, T. H.

AIR POLLUTION FROM AUTOMOTIVE EXHAUSTS. OBSERVATIONS IN BASEL. ((Die Verunreinigung der Atmosphare durch die Abgase der Motorfahrzeuge. Beobachtungen in Basel.)) Text in German Z. Praeventivmed., 11(2):157-160, March-April, 1966. 5 refs.

CO level was sampled in air taken from 8 areas of dense traffic during the period 1961-1964. Levels found ranged from 0 to 45 p.p.m., with occasional peaks to 90 p.p.m. These levels were about the same each year, in contrast to the sharp increase in the number of automobiles during that period. No conclusions are drawn from this observation, but the ambient air concentration of other exhaust gas components is pointed out as also significant. Averages are given for ammonia, SO2, NO2, and aldehyde. In order to clarify the possibility of eventual harm from lead additives in gasoline, urine samples from all traffic policemen were examined in 1965. There was no evidence of lead accumulation in any of the samples.##

08897

Felmeister, Alvin, Mohammad Amanat, and N. D. Weiner

INTERACTION OF NITROGEN DIOXIDE--OLEFIN GAS MIXTURES WITH LECITHIN MONOMOLECULAR FILMS. Environ. Sci. Technol., 2(1):40-43, Jan. 1968. 15 refs.

The interaction of nitrogen dioxide-olefin gas atmosphere with saturated lecithin monomolecular films were investigated using surface pressure measurements. Films of dipalmitoyl lecithin, a saturated phospholipide, showed no interaction with any of the test atmospheres used. Films of egg lecithin, an unsaturated phospholipide, showed significant changes in the urface pressure - surface area curves in the presence of all atmosphere containing nitrogen dioxide. The observed effects appear to be the result of a chemical interaction of NO2 with the double bonds of the egg lecithin rather than a simple physical penetration of the film. Biological implications are discussed. (Authors' abstract.)

08995

Petr, B. and P. Schmidt

SOME NEW POSSIBILITIES FOR OBSERVING THE INFLUENCE ON CHILDREN OF THE CHANGE IN LIVING ENVIRONMENT. I. LYMPHOCYTE REACTION AND THE MONOCYTE. ((Nektere nove moznosti sledovani vlivu smeneneho zivotniho prostredi na detsky organismus. I. Lymfocytarni reakce a monocytogram.)) Text in Czech. Cesk. Pediat. (Prague), 21(6):502-504, 1966. 8 refs.

A total of 128 children (aged 8-10) from 3 Czechoslovak towns were examined (Bohdanec, Ohrazenice and Rosice). SO2 levels of 0.03-0.32 mg/cu m and nitrogen oxides of 0.005-0.07 mg/cu m were found in 2 towns; the other town with clean air was used as a control environment. The pollutants cause an increase in erythrocyte count as well as a change in their size. Lymphocyte count increased and monocyte proliferation decreased significantly in children from the
8995
more pronounced in childre exposed to both SO2 and nitrogen oxides than in children exposed to SO2 alone.

09368

Thomas, Heriberto V., Peter K. Mueller, and Richard L. Lyman

LIPOPEROXIDATION OF LUNG LIPIDS IN RATS EXPOSED TO NITROGEN DIOXIDE. Science, 159(3814):532-534, Feb. 2, 1968. 7 refs.

Absorption spectra characteristic of diene conjugation and typical for peroxidized polyenoic fatty acids can be induced in rat lung lipids after the rats have been exposed to a scant amount of nitrogen dioxide (1 part per million) for 4 hours. The peroxidative changes do not occur immediately but appear to reach a maximum between 24 and 48 hours after exposure. The peroxidant effect of this atmospheric pollutant in rat lung lipids may be partially prevented by prior treatment of the animal with large doses of alpha-tocopherol. (Authors' abstract)##

09412

Ranier, W. Gerald, David L. Kelble, James P. Newby, and M. Sanchez.

EXPERIMENTAL EMPHYSEMA. Ann. Thorac. Surg., 3(6):539-548, June 1967. 40 refs. (Presented at the 3rd Annual Meeting, Society of Thoracic Surgeons, Kansas City, Mo., Jan. 23-25, 1967.)

Chronic sublethal exposure to 75-125 ppm NO2 for 30-min. periods combined with selective expiratory airflow obstruction is investigated in the rabbit. Similar histological effects were produced by both the Venturi principle and aeronautical flow obstruction tubes. Mortality of the exposed animals was quite high. Of 53 rabbits exposed to NO2, only 21 survived 1-6 months after last exposure; of 62 animals with obstructive tubes only, 7 survived 1-6 months after surgery; of 41 rabbits undergoing both gas exposure and surgery, 14 survived 1-6 months. Exposed animals exhibited diffuse alveolar destruction, with minimal fibrosis and reparative changes in the bronchiolar epithelium. There is a definite correlation between the lenght of the delay period prior to sacrifice and the degree of alveolar destruction, provided the animals were subjected to at least 20 NO2 exposures. Exposed rabbits with obstructive expiratory tubes developed expiratory wheezing, increased respiratory rates, and intolerance to even minimal exercise as delay periods were lengthened.

09440

McCarroll, James, Michael Lebowitz, Doris Wolter, Eric Cassell and Donovan Thompson

AIR POLLUTION AND ACUTE RESPIRATORY ILLNESS. Preprint, Washington Univ., Seattle, School of Medicine, ((28))p., 1967. (Presented at a joint meeting of the Pacific Northwest Section, American Industrial Hygiene Association and Northwest Association of Occupational Medicine, Portland, Oregon, Nov. 12, 1967.)

A three year study was conducted in New York City to determine what variations in the health of a normal urban population might be related to variations in their environment. The population studied included whites, Negroes, and Puerto Ricans from upper, middle, and lower income groups, and was divided into four categories: children (those under 15 years of age); adults; heavy cigarette smokers; and non-cigarette smokers. The total number of participants in the study was 1747 and each was observed for an average of 45 weeks. A questionnaire was developed containing approximately 120 items regarding variations in health. Each family was visited each week by a trained health interviewer who orally asked the questions in the questionnaire; questions were asked for each of the seven preceding days. An air pollution monitoring station was established in the center of the study area and measurements were made of SO2, particulates, carbon monoxide, and hydrocarbons. Also, monitoring records of a variety of other pollutants were obtained from the City. Continuous records were maintained on common meteorologic variables. The association between the daily prevalence rates of various health symptoms and the levels of air pollution are examined by several methods. The multiple correlation coefficients and the multiple regression coefficients of some of the symptom prevalence rates with air pollutants and meteorological factors are summarized. It is concluded that: a) there are associated relationships between symptoms in a normal urban population and a variety of environmental factors and b) no one factor, including air pollution, acts alone to produce most of the common illnesses.##

10456

Wayne, Lowell G. and Leslie A. Chambers

BIOLOGICAL EFFECTS OF URBAN AIR POLLUTION. Arch. Environ. Health, 16(6):871-885, June 1968. 14 refs.

Rodents exposed to the ambient atmosphere of Los Angeles throughout their lives have been studied in comparison with animals maintained in smog-filtered atmospherees. In aging inbred mice of certain strains, there was an increased incidence of pulmonary adenoma. In one strain mortality of males (but not females) during the first year of life was increased. Severe smog episodes caused lung tissue alterations at the ultrastructural level, especially in mice older than 15 months. Severe episodes produced transient increases in pulmonary resistance in old guinea pigs but no demonstrable chronic or cumulative effects on this parameter. In guinea pigs sensitized by prior stress treatment, urinary excretion of 17-ketogenic steroids was enhanced by ambient atmosphere exposure After two or three years of exposure, rabbits exhibited reduced activity of glutamic oxalcetic transaminase in blood serum. (Authors' abstract)

10490

Piddick, J. H. Jr. K. I. Campbell, and D. L. Coffin

THE EFFECTS OF CHRONIC NITROGEN DIOXIDE EXPOSURE ON DOGS: I. HISTAPATHOLOGY OF THE LUNG. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, (14)p. 1968. 17 refs.

The experiments reported were instituted to determine whether a larger species, the dog, would react similarly to nitrogen dioxide (NO2). Results indicate that such exposure produces pulmonary emphysema and associated interstitial fibrosis, increased reticulum fibers, and elastic fibers. No significant regression of these lesions was apparent in two dogs examined 8 months after termination of exposure.

10492

Holzman, R.S., D. E. Gardner, and D. I. Coffin

IN VIVO INACTIVATION OF LYSONZYME BY OZONE. Preprint,Public Health Service, Cincinnati, Ohio, National Center for Air Control, 1968. (13)p., 17 refs.

Bronchial mucus contains large quantities of the antibacterial enzyme lysozyme. Acutely exposing mice or rabbits to ozone reduced the amount of active lysozyme obtainable by bronchopulmonary lavage. The effect was proportional to ozone concentration as well as to duration of exposure. Enzyme activity returned to normal levels during the 12 hours following exposure. Five parts per million ozon for 3 hours reduced lysozyme levels approximately 30 percent. Studies of the release of lysozyme by alveolar cells support the theory that loss of activity is due to in vivo oxidation of lysozyme (Authors' abstract)

10514

Gregory, Kenton L., Victoria F. Malinoski, and Charles R. Sharp

CLEVELAND CLINIC FIRE SURVIVORSHIP STUDY 1929-1965. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, (22)p., July 22, 1968. 7 refs. (Presented at th 9th American Medical Association Air Pollution Medical Research Conference, Denver, Colorado, July 22-24, 1968.)

A long-term study was conducted to determine if there was an effect on the mortality experience of persons exposed to gases, such as HCN, CO, and NO, produced by the decomposition of nitrocellulose ray film. Such exposure occurred in a fire at the Cleveland Clinic, Cleveland, Ohio on May 15, 1929. Information was gathered concernin the 1965 survival status of all persons who were in the building or who helped with the rescue efforts. These data were categorized by exposed and unexposed groups and were analysed by modified life tabl methods. The results of these analyses and the problems incurred in this type of study are presented. (Author's abstract, modified)

10613

Anthony A. Thomas

SPACE CABIN TOXICOLOGY. In: NASA, Marshall Space Flight Center 5th Annual Meeting, Air Force Systems Command, Wright-Patterson AFB, Ohio, p. 207-217, March 3, 1967. 18 refs.
NASA: N68-17369

Space cabin toxicology is a new and challenging area of research in life support. The unique problem of this branch of toxicology is the truly uninterrupted continuous nature of exposure to chemical toxicants. Fundamental research in the last two years has answered the following most urgent basic questions. Continuous exposure can lead to a "summation of interest" type of toxic effect because daily recuperative periods from exposure are non-existent. The exotic atmospheric environment can influence the outcome of toxic damage; reduced barometric pressure and oxygen-rich atmosphere are influencing factors. All cabin materials can and must be screened by analytical and biological methods to increase the health and performance of the crew in future manned space missions. To answer these questions, experiments were conducted with animals in controlled atmosphere chambers at reduced pressure. Various contaminant materials were introduced for long exposures times. The tests themselves lasted up to eight months, thus giving a good indication of the effects of long-term exposure to a "space cabin" atmosphere.##

10685

Bils, Robert F. and Michael J. Evans

THE EFFECTS OF OZONE, NITROGEN DIOXIDE AND OTHER GASEOUS AIR POLLUTANTS ON MAMMALIAN RESPIRATORY TISSUES -- A REVIEW OF LIGHT AND ELECTRON MICROSCOPE STUDIES. Preprint, Allan Hancock Foundation and University of Southern California, Los Angeles, Dept. of Biological Sciences, 20p., 1968. ((49)) refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-83.)

Morphological changes associated with the toxicity of ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide and other gaseous air pollutants are reported. Microscopical investigations have been made using concentrations of ozone ranging from 0.2 to 50 ppm on mice, rats, hamsters, rabbits, and dogs. Methods of exposure varied from single doses for 1 to 6 hours, to multiple or continuous doses for up to 433 days. Morphological changes seen with the light microscope after a single dose are accumulation of edema fluid and migration of leukocytes into the alveolar space. Electron microscopy has revealed swelling and rupture of endothelial and epithelial cells and accumulation of cell debris in the alveoli. In prolonged studies chronic pneumonitis and contracted alveolar septa are seen. The effects of nitrogen dioxide on mammals are seen mostly in the respiratory tract. Experimental exposures as high as 400 ppm cause bronchopneumonia and death within minutes in laboratory animals. At 40-80 ppm severe ultrastructural alterations were seen in middle-aged mice exposed to NO2 for about 1 hour. The same age animals exposed for 24 hours at 25 ppm showed slight damage to lung lining membranes. A similar effect was produced at 15 ppm for four hours each day for six weeks, but such changes are easily reversible. Very slight histopathology is evident with levels in the 0.5-5 ppm range continuously for 12 months or more. Sulfur dioxide produces little or no morphologic change in lungs even with daily exposures of 25-50 ppm for a month. Severe ultrastructural damage to the lungs has been reported after 15-30 minutes of 0.5-1.0% carbon monoxide. Natural Los Angeles smog affected mouse lungs much like the ozone at 1.3 ppm.##

11241

E. M. Roth, W. H. Teichner, and A. O. Mirarchi

CONTAMINANTS STANDARDS. (SECTION 13.) In: Compendium of Human Responses to the Aerospace Environment, Volume III, Sections 10-16, Emanuel M. Roth (ed.), Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., CONTRACT ¬NAS-115', p. 1-115, Nov. 1968. 233 refs.
CFSTI: NASA CR-1205(III

Toxicological problems in space operations cover three situations: (1) the acute, short term, high-level exposure either in ground support or space cabin conditions; (2) the 8-hour work day exposure found in manufacturing and ground support situations; and (3) continuous, long term exposure to trace contaminants, such as would be anticipated in extended space missions. In view of the necessity for provisional limits of manned space flights of 90 to 1000 days duration the following criteria for trace contaminant control in manned spacecraft have been derived: Contaminants must not produce significant adverse changes in the physiological, biochemical, or mental stability of the crew. The spacecraft environment must not contribute to a performance decrement of the crew that will endanger mission objectives. The spacecraft environment must not interfere with physical or biological experiments nor with medical monitoring. Based on these criteria air quality standards for prolonged manned missions have been established. The following topics are discussed: kinetics of contaminants in space cabins; toxicological factors; toxicology in the spacecraft environment; source of contaminants; particulates and aerosols; microbial contaminants. Tables presenting chemical analysis of all contaminants with standard levels for space cabins are listed.##

11297

Buckley, Ramon D. and Clayton G. Loosli

EFFECTS OF NO2 INHALATION ON GERMFREE MOUSE LUNG. Preprint, University of Southern California, Los Angeles, School of Medicine, 19p., 1968. 17 refs. (Presented at the Air Pollution Medical Research Conference, Denver, Colo., July 22-24, 1968, Session IV: Animal Toxicology, Paper 3.)

Structural and metabolic responses of germfree and gnotobiotic mouse lung to nitrogen dioxide were studied. The course of respiratory infection in mice mono-contaminated via aerosol clauds of bacteria or virus was also determined. Histological observations showed that germfree mice exposed continuously to NO2 developed changes in the bronchial epithelium. Tissue localization and relative activity of lactic dehydrogenase (LDH) acid and alkaline phosphatase enzymes were used to study alterations in lung metabolism induced by NO2 at the cellular level. The lungs of NO2 exposed mice showed intense LDH activity. The results of oxygen consumption studies on lung slices of NO2 exposed germfree mice showed a significant increase in oxygen consumption after 15 min. incubation and from each time internal thereafter. The lung clearance rate of germfree NO2 exposed mice to bacteria was not impaired. Studies indicated that germfree control and NO2 exposed animals responded similar to virus infection.##

11306

Henry, Mary C., Richard Ehrlich, and William H. Blair

EFFECT OF NO2 ON RESISTANCE OF SQUIRREL MONKEYS TO K. PNEUMONIAE INFECTION. Preprint, ((22))p., 1968. 9 refs. (Presented at the Air Pollution Medical Research Conference, Denver, Colo., July 22-24, 1968, Session IV: Animal Toxicology, Paper 2.)

There is an effect of nitrogen dioxide on the resistance to respiratory infection in monkeys. Exposure to nitrogen dioxide may permit better colonization of bacteria in the lungs of monkeys by inhibition of the mechanism of bacterial clearance from lungs and thus resulting in increased mortality.##

11307

Emik, L.O. and R.L. Plata

DEPRESSION OF RUNNING ACTIVITY IN MICE BY EXPOSURE TO POLLUTED AIR. Preprint, California Univ., Riverside, Statewide Air Pollution Research Center, 12p., 1968. 6 refs. (Presented at the Air Bollution Medical Research Conference, Denver, Colo., July 22-24, 1968, Session IV: Animal Toxicology, Paper 1.)

Mice in activity wheels were exposed continuously to diluted raw or irradiated and unirradiated auto exhaust for a period of 8 weeks, using a diurnal cycle simulating Los Angeles conditions in heavy smog. Those in irradiated exhaust showed an immediate depression greater than those in raw exhaust, each gradually recovering and finally surpassing the controls by the end of the experiment. A balanced half each of control and irradiated exhaust groups was switched to the other exposure for the second 4 weeks. The controls later placed into irradiated exhaust ran significantly less than any other group. On a daily basis, no significant treatment effects were found although the LAF males always ran significantly (P less than .01) farther than their BALB chamber mates. The exhaust atmospheres appeared to modify the diurnal cycles of activity, generally flattening the usual night peak, but no detailed analyses were made. The mice exposed to ozonized gasoline fumes gradually recovered their control level of activity when continually exposed for several weeks. With this background of experience, mouse activity was included as one measure of the effects of ambient air pollution exposure.##

11308

Freeman, Gustave

THE SUB-ACUTE NO2 LESION OF THE RAT LUNG. Preprint, Stanford Research Inst., Menlo Park, Calif., Dept. of Medical Sciences, 5p., 1968. 9 refs. (Presented at the Air Pollution Medical Research Conference, Denver, Colo., July 22-24, 1968. Session IV: Animal Toxicology, Paper 6.)

Two main issues were explored in studies with NO2 in rats. One was the highest level of NO2 in ambient air that would not acutely injure the respiratory tract, and the other was the contribution NO2 might make in the pathogenesis of pulmonary emphysema in man. Investigations were limited to concentrations below which NO2 could incite acute effects such as edema, destruction of cells, and inflammatory reaction in the lung. Rats grew normally and survived natural lifetimes in an atmosphere containing the realistic concentration of 0.8 plus or minus 0.2 ppm NO2, but they consistently exhibited a moderate degree of tachypnoea without apparent distress. A similar series was exposed to 2 plus or minus 1 ppm, with similar results. In both cases, the lungs appeared grossly normal and contracted on exposure to the atmosphere. Microscopically, however, sections revealed changes of the terminal bronchiolar epithelium in the latter group that were seen only rarely in the 0.8 plus or minus 0.2 ppm group but not in controls. The development of emphysema-like lungs was accompanied by enlargement of the thoracic cage, with dorsal dyphosis. The unrelenting effect of continuous NO2 might not allow time for much pulmonary tissue to be destroyed before death but this might occur with somewhat less persistent exposures.##

11309

Ishikawa, S., D. H. Bowden, V. Fisher, and J. P. Wyatt

THE EMPHYSEMA PROFILE' IN TWO MIDWESTERN CITIES IN NORTH AMERICA. Preprint, Manitoba Univ., Winnipeg, Dept. of Pathology and Saint Louis Univ., Mo., Dept. of Anatomy, 11p., 1968. 7 refs. (Presented at the Air Pollution Medical Research Conference, Denver, Colo., July 22-24, 1968, Session VI: Emphysema, Paper 3.)

In a comparitive study there was considerably more emphysema in St. Louis than Winnipeg and the anatomic emphysema was found much earlier and appeared to progress more rapidly. In neither city were cases of severe emphysema observed in non-smokers. From these basic observations on these two cities, which have striking differences in the degree of environmental pollution, it appears that smoking is not the only factor concerned in the development of emphysema. The importance of environmental pollution is further strengthened by the fact that the incidence of severe emphysema in comparable groups of cigarette smokers is four times as high in St. Louis as it is in Winnipeg. These findings suggest that the development of emphysema may be related to a synergistic effect of smoking and environmental pollution. The sharp distinction between the emphysema profiles of these two cities further emphasizes the epidemiologic value of correlating various parameters of urban living with patterns of lung pathology.##

11314

Lewis, Trent R., Kirby I. Campbell, and Thomas R. Vaughan, Jr.

EFFECTS OF CHRONIC EXPOSURE TO AIR POLLUTANTS ON CANINE PULMONARY FUNCTION. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 15p., 1968. 21 refs. (Presented at the Air Pollution Medical Research Conference, Denver, Colo., July 22-24, 1968, Paper 4.)

The purpose of the present investigation was to assess toxicity, in terms of pulmonary function, in canine subjects exposed to two chronic inhalation regimens. The first study was to determine effects and interactions of individual and combined oxides of sulfur in normal subjects compared with "impaired" subjects (previously exposed to NO2 and determined to have lung pathology), as well as to determine residual functional effects in the "impaired" and "unimpaired" animals. The second study was intended to determine pulmonary functional alterations in animals exposed to NO2 plus a relatively inert particulate material, FeO3 dust. The nitrogen dioxide - oxides of sulfur experiment (study 1) yielded statistically significant results for diffusion capacity, compliance, and resistance. Dogs receiving H2SO4 aerosol had a lower mean diffusion capacity (6.3 ml/mm Hg/min) than the mean diffusion capacity for the other four treatment groups that did not receive H2SO4 (7.4 ml/mm/ Hg/min). This difference in diffusion capacity was statistically significant at 0.01 probability level. It should be noted that the H2SO4 aerosol effect on diffusion capacity was independent of the SO2 or NO2-impairment, which the animals may or may not have received.##

11425T

Nakamura, K.

RESPONSE OF PULMONARY AIRWAY RESISTANCE BY INTERACTION OF AEROSOLS AND GASES IN DIFFERENT PHYSICAL AND CHEMICAL NATURE. Translated from Japanese. Japan. J. Hyg. (Tokyo), 19(5):322-333, 1964. 37 refs.

Inhalation tests were conducted on 25 healthy males to determine their response in pulmonary airway resistance to the interaction of aerosols and irritant gases. The subjects were divided into 3 groups; Group 1 inhaled SO2 for 5 minutes, followed by a misture of SO2 with a large-size NaCl aerosol; Group 2 inhaled NO2 for 5 minutes, followed by a small-sized NaCl aerosol; and Group 3 inhaled NO2 for 5 minutes followed by a mixture of NO2 and a large-size NaCl aerosol. The airway resistance (AWR) values immediately after inhalation were measured by the airway interruption technique, and the intensities of the reactions were compared. The control values for the AWR were those prior to the tests. The AWR increased synergistically in Groups 1 and 3. In Group 2 the AWR for NO2 and NO2 plus aerosol was higher than the control value, and practically no change in reaction was observed when the NO2 was mixed with the NaCl aerosol. The synergistic effect of an irritant gas and an inactive aerosol is greatest when the aerosol particle size is around 1 micron, and the increase in airway resistance in this case is believed to be due to reactive constriction of the respiratory bronchiles and alveolar ducts.##

11470T

Henschler, D.

PROTECTIVE EFFECT OF PRETREATMENT WITH SMALL GAS CONCENTRATIONS AGAINST FATAL PULMONARY EDEMA CAUSED BY IRRITANT GASES. ((Schutzwirkung einer Vorbehandlung mit geringen Gaskonzentrationen gegen todliche Reizgas-Lungenodeme.)) Translated from German. Arch. Exp. Pathol. Pharmakol. (Berline), Vol. 238, p. 66-67, 1960. 4 refs.

In order to elucidate the mode of effect of irritant gas, the mechanism of a tolerance increase was studied, as it develops following the effect of small gas concentrations. This effect, which is known for phosgene and ozone, was determined also for nitrous gases. These three gases exert a protective effect of differing intensity with respect to each other, with the exception of the combination of nitrous gases and phosgene. This protection is consequently neither a principle valid for all conbimations of irritant gases, nor is it specific for any one type of gas. This finding permits exclusion of an antibody-antigen reaction as the mechanism involved. The following working hypothesis regarding the mechanism of the protective effect is proposed: irritant gases diffuse through the alveolor wall and only that portion which is not hydrolytically disintegrated exerts an edema-inducing effect, by reacting with structural elements of the pulmonary capillaries. The hydrolysis of acid gas is consequently not, as has often been assumed, the basis for the formation of an edema, but an essential factor of detoxication.##

11489

Gol'dberg, M. S.

BIOLOGICAL EFFECTS OF ATMOSPHERIC POLLUTANTS AND HYGIENIC STANDARDS FOR ATMOSPHERIC POLLUTANTS OUTSIDE THE USSR. ((Problema biologicheskogo deistviya atmosfernykh zagryazneii i ikh gigienicheskogo normirovaniya za rubezhom.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 33(4-6):245-250, April-June 1968. ((13)) refs.
CFSTI: TT 68-50449/2

A brief discussion is presented of a few achievements in the biological effects of pollutants and standards in the U.S.A., Great Britatin, and Germany. Studies being conducted on the effects on man of prolonged exposure to low concentrations of atmospheric pollutants are mentioned. Air pollution episodes in New York (1953) and London (1952) are briefly mentioned. Also discussed is the problem of the effect of the dispersity of dust particles containing 3.4 benzpyrene upon carcinogenic activity.##

11535

Campbell, Kirby I., L. Otis Emik, George L. Clarke, and Roger L. Plata

INHALATION TOXICITY OF THE AIR POLLUTANT PEROXYACETYL NITRATE: DEPRESSION OF VOLUNTARY ACTIVITY IN MICE. Preprint, California Univ., Riverside, Statewide Air Pollution Research Center, and Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, ((14))p., ((1968)). m refs.

Sublethal acute toxicity, in terms of depression of voluntary physical activity (wheel-running), was determined in mice inhaling the photochemical air pollutant peroxyacetyl nitrate (OAN) for 6-hour periods at concentration of 2.8, 3.7, 5.5, 6.4, and 8.6 parts per million by volume (ppm). All concentrations tested depressed both 6-hour (test period) and 24-hour activity, following which recovery to standard level required 2 to 4 days. The concentration depressing activity by 50% (termed "Activity50") was estimated at 4.5 and 4.1 ppm for the 6- and 24-hour activity respectively. By use of Activity50 index the toxic potency of PAN was compared with that of other pollutants as follows (descending rank): ozone, acrolein, nitro-olefins, ozonized gasoline vapor, ?pan, nitrogen dioxide, carbon monoxide, irradiated and non-irradiated auto exhaust. The criterion of activity depression at threshold exposures is discussed briefly. (Authors' abstract) ##

11539

MacEwen, J. D. and R. P. Geckler

COMPARATIVE STUDIES OF 90-DAY CONTINUOUS EXPOSURE TO O3, NO2 AND CCL4 AT REDUCED AND AMBIENT PRESSURES. (FINAL REPORT.) Aerosjet-General Corp., Azusa, Calif., Contract AF 33(657)-11305, Proj. 6302, Task 630201, AMRL-TR-67-68, 67P., Feb. 1968. 25 refs.
CFSTI, DDC: AD 669079

Ninety-day continuous animal exposures to ozone, nitrogen dioxide and carbon tetrachloride at Threshold Limit Values were conducted under ambient pressure and 100% oxygen-reduced pressure (5 psia) conditions. Four species, dogs, monkeys, rats, and mice were exposed to each material. Guinea pigs were also used for ozone exposures due to their reported susceptibility to this pulmonary irritant. Minimal biologic responses were observed with exposure to each of the compounds tested and, consequently, lower tentative exposure limits are recommended for space cabin environments. The recommended limits, based on the time period tested, are 1 ppm for nitrogen dioxide, 0.01 ppm for ozone, and 0.5 ppm for carbon tetrachloride. (Authors' abstract) ##

11565

Freeman, G., S. C. Crane, R. J. Stephens and N. J. Furiosi

PATHOGENESIS OF THE NITROGEN DIOXIDE-INDUCED LESION IN THE RAT LUNG: A REVIEW AND PRESENTATION OF NEW OBSERVATIONS. Am. Rev. Respirat. Diseases, 98(3):429-443, Sept. 1968. 50 refs.

The induction of an emphysema-like condition in rats by continuous exposure to nonedema-producing and non-necrotizing levels of NO2(10 to 25 ppm) is described. The increased weight of the voluminous, air-containing lungs was shown to result from widespread hypertrophy of respiratory epithelium, especially in alveoli closely associated with alveolar ducts and in terminal bronchioles. Neither excessive fluid nor areas appeared compressed. Concentrations of 2+1 ppm during the natural lifespan of the rat (about two to three years) did not cause grossly emphysematous lungs but were associated with either reduction or disappearance of bronchiolar cilia, clear inhibition of normal exfoliation and blebbing of the epothelial cells, and the appearance of cytoplasmic, crystalloid inclusions of uncertain nature.##

11568

Horn, K.

AN UP-TO-DATE REVIEW OF THE EFFECTS OF AIR POLLUTION ON THE POPULATION. ((Uber die Auswirkung der Luftverunreinigung auf die Bevolkerung - Eine neure Ubersicht-)) Text in German. Z. Ges. Hyg., 14(6):410-413, June, 1968. 24 refs.

The effects of the increasing incidence of air pollution on human health are discussed. Distinction is made among the immediate (24-48 hr.), delayed (weeks to months), and chronic effects (years) of exposure to air pollution. Four areas considered are: non-specific respiratory diseases; experimental and epidemiological studies on chronic effects of air pollution; studies on premorbid conditions resulting from air pollution; and incidence of lung cancer. Air pollution is viewed as one of many etiological factors influencing incidence of colds, influenza and other respiratory conditions, but it may be a precipitating factor in the development of chronic conditions. Statistical correlations between air pollution (oxides of nitrogen, sulfur, and silicon) and urban incidence of chronic bronchitis, keratoconjunctivitis, atonia and penumonia have been reported. Rheumatic heart disease seems more related to socioeconomic factors than to air pollution. Urban children exposed to air pollution show microcytic anemia and retardation of bone development. Correlation between urban air pollution and lung cancer has been noted. A decrease in lung cancer mortality was reported among British immigrants to USA, Australia or South Africa even though their cigarette consumption remained the same or increased.##

11632

Vaughan, Thomas R., Jr., Lesta F. Jennelle and Trent R. Lewis

EFFECTS OF CHRONIC EXPOSURE TO LOW LEVELS OF AIR POLLUTANTS ON PULMONARY FUNCTION IN THE BEAGLE. Preprint, Public Health Service, Cincinnati, Ohio National Air Pollution Control Administration, ((19))p., ((1968)). 29 refs.

One hundred and four beagles have been exposed for 18 months to natural and photochemically reacted auto exhaust, oxides of nitrogen and oxides of sulfur. No differences in single breath carbon monoxide diffusing capacity, dynamic pulmonary compliance or total expiratory pulmonary resistance were found between exposed and control animals. Removal of reactive gases in the upper airway was studied during brief exposures in an additional small group of animals. Under these conditions, 100% removal of O3 and SO2, 90% removal of NO2, 73% removal of NO and no removal of CO or hydrocarbon were found. (Authors' abstract)##

11670

Donald E. Gardner, Robert S. Holzman, and David L. Coffin

EFFECTS OF NITROGEN DIOXIDE ON PULMONARY CELL POPULATION. Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, ((11))p., ((1968)). 11 refs.

Studies have shown that ozone has produced changes in the number and function of cells obtained by pulmonary lavage. In similar experiments, rabbits exposed to levels of NO2 from ambient to 60 ppm demonstrated increased numbers of polymorphonuclear leukocytes in the lung washings. This phenomenon persisted for more than 72 hours following a single 3-hour exposure. When streptococci were instilled in the lungs of NO2-exposed anesthetized rabbits 30 minutes prior to lavage, a pronounced inhibition of phagocytic activity was observed. Using these criteria, NO2 appeared less effective than ozone as a pulmonary irritant. (Authors' abstract, modified)##

11679

N. D. Weiner, M. Amanat, D. Blondo, R. Caprioli, N. Dinerman, and A. Felmeister

INTERACTION OF NO2 WITH MONOLAYERS OF PHOSPHOLIPIDS EXTRACTED FROM E. COLI AT 15 DEGREE C AND 37 DEGREE C. Preprint, Columbia Univ., New York, Coll. of Pharmacy, 12p., March 29, 1968. 10 refs.

Phospholipids were extracted from E. coli grown at 15 degree C and 37 degree C. The fatty acid residues of the 15 degree C phospholipids were found to be considerably more unsaturated than the 37 degree C phospholipids. These phospholipids were spread as monomolecular films and exposed to NO2 containing atmosphere. Whereas the 37 degree C phospholipid films showed no interaction, NO2 was found to expand considerably the 15 degree C phospholipid films. The results demonstrate that simple changes in environmental conditions may affect markedly the interaction of air pollutants such as NO2 with biological membranes. (Authors' abstract)##

11682

11682
Alvin Felmeister, Mohammad Amanat and Norman D. Weiner

INTERACTION OF PROTEIN AND LIPOPROTEIN MONOLAYERS WITH NITROGEN DIOXIDE-TRANS 2-BUTENE GASEOUS MIXTURES. Preprint, Columbia Univ., New York, Coll. of Pharmacy, ((8))p., ((1968)). 4 refs.

The interactions of pollutant atmospheres with oriented protein and lipoprotein films was studied. A gas train assembly, Teflon coated trough, and Wilhelmy plated method of surface pressure measurement was used. The films were then exposed to a standard atmosphere (i.e., air flowing at the rate of 300 ml/min) or to the following test atmospheres, all flowing at this same rate of 300 ml/min: (a) 0.33% nitrogen dioxide in air; (b) 0.08% trans 2-butene in air; and (c) 0.33% nitrogen dioxide and 0.08% trans 2-butene in air. Significant changes in the -A curves for the pure protein films were observed in the presence of all atmospheres containing nitrogen dioxide, while the trans 2-butene did not interact with the film, nor did it appear to influence the nitrogen dioxide film interaction. However, whereas exposure of unsaturated phospholipid films to nitrogen dioxide containing atmospheres resulted in a large expansion of the film, exposure of bovine albumin film to these same test atmospheres resulted in a significant contraction of the film. The data obtained suggest that the effect of NO_2 on the lipoprotein films studied, appears to be a function only of the phospholipid component of the film. In general, membrane lipoproteins contain a large proportion of unsaturated phospholipids attached to structural and functional protein. In vivo interaction of the supporting phospholipid with nitrogen dioxide, or other reactive pollutants, could result in an expansion of the exposed cell membrane. This expansion would then lead to a change in the conformation of the attached protein. In the case of a functional protein, changes in conformation would be accompanied by changes in enzyme activity.##

12038

HEALTH AND AIR POLLUTION SUBJECT OF NEW STUDIES. Environ. Sci. Technol., 2(4):246-249, Apr. 1968.

For the next seven years, Hazleton Laboratories Inc. will be studying the effects of air pollutants on laboratory animals, including guinea pigs and monkeys. One study financed by Edison Electric Institute and National Coal Association is intended to provide data useful in setting criteria for the three most conspicuous pollutants emitted from stacks of coal-burning plants: SO_2, H_2SO_4 mist, and flyash. Test animals exposed to the pollutants are being checked regularly to determine whether their respiration is being affected and if so, how much. The second study, financed by the American Petroleum Institute will emphasize the possible role of synergism in air pollution. This study will cover various concentrations of five air pollutants: CO, NO_2, SO_2, lead chlorobromide, and $CaSO_4$.##

12949

Soda, Reiten

POLLUTED AIR PRODUCTION WITH GASEOUS PARTICLES. (Gasujo no osenbutsu ni yoru osen-kuki sakuseiho). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 6(7):10-17, 1969. 17 refs.

Special techniques have been devised using scattering cells, permeation tubes, or multiple step dilution to obtain a reproducible contaminated atmosphere. Artificially polluted air is used not only in the evaluation of a high efficiency air filter, but also in the experimental analysis of harmful effects on animals. Different gas particles are used and gas concentrations are also varied for different experiments. For example, CS_2 (0.1 ppm) and C_6H_6 (1 ppm) are used for animal inhalation experiments and hydrocarbons (100 ppm), SO_3 (10 ppm), and nitrogen oxides (10 ppm) are used for the measurement of collection ratios of high efficiency air filters. To perform these experiments and measurements correctly, purity, concentration, temperature, and pressure of the polluted gas should be stable.

13852

Buckley, Ramon D. and Clayton G. Loosli

EFFECTS OF NITROGEN DIOXIDE INHALATION ON GERMFREE MOUSE LUNG. Arch. Environ. Health, 18(4):588-595, April 1969. 16 refs.

The role of nitrogen dioxide (NO_2) alone as a causative agent of structural and metabolic alteration to lung tissue, without the synergistic effects of superimposed bacterial or viral infections, was investigated by exposing germfree mice to pure NO_2 in sterile chambers and then killing them after an appropriate exposure period. This method made possible the production and characterization of a chemically induced lesion not altered by the presence of respiratory disease-causing organisms. Examination of the NO_2-exposed tissue showed that alterations involved primarily the bronchiolar epithelium and alveolar tissue near terminal bronchioles and suggested that a stimulation in cell activity, rather than damage and destruction, results from NO_2 inhalation, at least at the exposure levels involved. Results also suggested that only cells in direct contact with NO_2 undergo structural and metabolic change. In an additional study, both germfree and conventional mice, after NO_2 exposure, were contaminated with either staphylococcus aureus bacteria or with influenza virus. Although there was greater deposition of organisms in the lung of NO_2-exposed animals than in the germfree control group, the lung clearance rates for S. aureus of both groups were nearly identical. Control and NO_2-exposed germfree mice both responded to virus contamination with significantly increased resistance, much the same as conventional mice, a phenomenon which is not understood at present.

13860

Feldstein, M.

TOXICITY AND ANALYSIS OF AIR POLLUTANTS. J. Forensic Sci., 14(3):337-351, July 1969. 44 refs.

The emission of solids, liquids, and gases from industrial operations, power and heat generation using fossil fuels, combustion of organic waste materials, and auto exhaust constitute the major sources of air pollution. Carbon monoxide, as a community air pollutant, is emitted to the atmosphere from most combustion operations where incomplete combustion of organic matter occurs. Exposures to 30 ppm for four to six hours may result in blood carboxyhemoglobin concentrations as high as 8% of the total pigment. Nitrogen dioxide is the primary reactant in photochemical smog, and is found to cause acute pulmonary edema. Physiological response to low concentrations of both SO2 and SO3 is similar and involves bronchial constriction. The response with SO3 is 4 to 20 times greater in experimental animals than with SO2 on an equal concentration basis. It is now believed that there is no tolerable dose of a carcinogen. Skin tumors were produced in animals by as little as 0.4 micrograms of benzpyrene. Part of the reason for increased lung cancer is ascribed to carcinogens present in air pollution. Several other pollutants and the various ways of analyzing pollutants are also discussed.

13868

Yokoyama, Eiji

VARIATIONS OF VENTILATORY DYNAMICS IN EXPERIMENTAL EXPOSURE TO SO2 AND NO2. (SO2 oyobi NO2 jikken-bakuro-ji no kanki-rikigaku-chi no henka). Text in Japanese. Arerugi Nippon Zasshi (Jap. J. Allergy), 16(10):56-60, Oct. 1967. 17 refs.

Six healthy adults aged 20 to 36 were experimentally exposed to SO2 gas, and five healthy adults aged 18 to 37 were exposed to NO2 gas. Pulmonary flow resistance, pulmonary compliance, FRC, and respiratory rate were measured. Concentrations of SO2 during the experiment were 36 to 40 ppm; those of NO2 were 6 to 17 ppm. Experimental exposure to these two gases and similar analyses were made in anesthetized dogs and guinea pigs. Flow resistances of the lungs and thorax because of bronchoconstriction were commonly increased by both SO2 and NO2 in three experiments. The following response to these gases, however, differed. Increase of pulmonary flow resistance to SO2 was inhibited by the subcutaneous administration of 0.7 mg of atropine sulfate, but no inhibition by atropine was observed with NO2. Respiratory rate was increased by NO2 and decreased by SO2 in an experiment with guinea pigs. Variation in pulmonary compliance was more marked with NO2 than with SO2. The SO2 was found to stimulate mainly the upper respiratory tract (nose, throat, and upper trachea) because it is water-soluble and because more than 95% of it is absorbed within the upper respiratory tract. The NO2 was found to stimulate mainly the peripheral portion of the lung because it does not dissolve easily in water and thus is easily brought to the peripheral portion of the respiratory tracts. Nitrogen dioxide was found to have an oxidizing action and to damage the pulmonary mucosae more markedly than the reductive action of SO2.

14050

Gregory, Arthur R. and Charles H. Hine

NEONATAL RESISTANCE TO LUNG EDEMA. Proc. Soc. Exp. Biol. Med., vol. 128:693-695, July 1968. 15 refs.

The resistance of newborn rats and mice to lung edema was determined by simultaneously injecting adult rodents and their newborn offspring with thiourea and by comparing the toxicity of inhaled NO2 in adults and newborn. Newborn rodents survived injections in good health but the mothers, in grooming their young, ingested fatal amounts of thiourea. Their deaths were characterized by pulmonary edema and hemorrhage. The median lethal dose (LD50) of thiourea for adult rats was 47 mg/kg; that for newborn rats was 1.2 gm/kg. Resistance to NO2 was also high in the young. These results are in direct contrast to both original data and data from the literature on the ordinarily increased sensitivity of newborn animals to most drugs and toxic agents. It is theorized that immaturity of the pituitary-adrenal axis, together with thyroid deficiency and thyroid insensitivity, is important in the resistance of newborn animals to these inducers of lung edema. Hypoventilation is also suggested as a possible protective mechanism.

14065

Weiner, N. D., M. Amanat, D. Blondo, R. Caprioli, N. Dinerman, and A. Felmeister

INTERACTION OF NO2 WITH MONOLAYERS OF PHOSPHOLIPIDS EXTRACTED FROM E. COLI AT 15 AND 37 DEGREES. J. Pharm. Sci., 57(8):1398-1400, Aug. 1968. 10 refs.

The purpose of the study was to determine whether the membrane phospholipids extracted from Escherichia coli grown at 15 and 37 deg would exhibit differences in their interaction with an air pollutant such as NO2. The fatty acid residues of the 15 deg phospholipids were found to be considerably more unsaturated than the 37 deg phospholipids. These phospholipids were spread as monomolecular films and exposed to NO2-containing atmospheres. Whereas the 37 deg phospholipid films showed no interaction, NO2 was found to expand considerably the 15 deg phospholipid films, probably the result of the interaction of NO2 with the double bonds of the unsaturated fatty acid groups. The results demonstrate that simple changes in environmental conditions may markedly affect the interaction of air pollutants such as NO2 with biological membranes. (Author abstract modified)

14079

Abe, Mutsuo

EFFECTS OF MIXED NO2-SO2 GAS ON HUMAN PULMONARY FUNCTIONS. Bull. Tokyo Med. Dental Univ., 14(4):415-433, 1967. 30 refs.

Experimental studies were carried out on the effects of SO2, NO2, and a mixed SO2-NO2 gas on the human pulmonary functions by measuring the values of ventilatory mechanics, by spirometry, and by peak flow rate. The effects of SO2 are immediate but not durable. Those of NO2, on the contrary, are late-acting and durable. The effects of a mixed SO2-NO2 gas are intermediate between those of NO2 and SO2 alone, showing no cumulative effects of the two gases, only additive ones. Such differences of the effects between two gases are supposed to be attributed to the grade of water solubility of each gas; SO2 is readily soluble and NO2 difficultly soluble. (Author abstract modified)

14081

Kleinerman, Jerome and C. Richard Cowdrey

THE EFFECTS OF CONTINUOUS HIGH LEVEL NITROGEN DIOXIDE ON HAMSTERS. Yale J. Biol. Med., 40(5-6):579-590, April-June 1968. 11 refs.

In an attempt to experimentally produce emphysema lesions by exposure to nitrogen dioxide, the experimental design of earlier studies was altered so that the previously untested Syrian hamster species could be continuously exposed (20 to 22 hrs/day) for a prolonged period to concentrations of NO2 sufficiently high to produce a moderate mortality (45-55 ppm). Experimental findings are presented. While the size of the alveolar spaces appeared enlarged in the exposed animals compared to the controls, there was no evidence of destruction of alveolar septal tissue, leading to the conclusion that a tissue-destructive form of emphysema was not produced in this experiment. The use of continuous exposures for prolonged periods, even at concentrations that produce a mortality of approximately 35%, does not appear to alter the nondestructive character of the tissue response. The hamster thus joins the other rodent groups previously studied, by these authors as species that respond characteristically to NO2 inhalation by an exudative and proliferative reaction without evidence of tissue destruction. The character and degree of the epithelial and inflammatory response appear similar in kind and proportional in extent to the time concentration product imposed. The variability in the response among bronchioles in a single lung is seen as even more disquieting than the differences in degree of reaction among animals similarly exposed, suggesting that profound differences in the uniformity of distribution of the inhaled noxious agent exist. These observations are consistent with physiological observation, but their fundamental basis remains unclear. The rapid and almost complete involution of the epithelial hyperplastic and inflammatory response produced by NO2 in the animals studied 30 days after cessation of exposures is considered remarkable and is thought to demonstrate the extensive reparative properties of the lung. The return toward normal of the lung volumes and right ventricular weights in this group again suggests that a reversible lesion is being repaired and lends support to the conclusion that no permanent tissue destruction has been produced by these profound experimental exposures. Two factors are discussed as possible causes of apparent differences between these results and those of other investigators carrying out similar experiments: the use of varying definitions of the term emphysema and varying techniques to inflate and fix lung tissue. A record of a discussion of this paper is included.

14119

Heuss, Jon M. and William A. Glasson

HYDROCARBON REACTIVITY AND EYE IRRITATION. Environ. Sci. Technol., 2(12):1109-1116, Dec. 1968. 21 refs.

Twenty-five hydrocarbons and nitric oxide were irradiated in a smog chamber. Eye irritation and various chemical reaction rates and product yields were used to measure hydrocarbon reactivity. Although the chemical measurements of reactivity correlated with one another to a fair degree, there was no correlation between any of the chemical measurements and eye irritation. A correlation was found between hydrocarbon structure and eye irritation; a hydrocarbon reactivity scale based on eye irritation is presented. The most potent precursors of eye irritation were benzylic hydrocarbons and aromatic olefins. A new and extremely potent eye irritant, peroxybenzoyl nitrate, a lachrymator 200 times as potent as formaldehyde, was identified as a product from the irradiation of benzylic hydrocarbons and aromatic olefins. (Author abstract modified)

14377

Freeman, Gustave, Sheldon C. Crane, Robert J. Stephens, and N. J. Furiosi

ENVIRONMENTAL FACTORS IN EMPHYSEMA AND A MODEL SYSTEM WITH NO2. Yale J. Biol. Med., 40(5-6):566-575, April-June 1968. 44 refs.

A model of an emphysema-like disease based on the covert effects of environmental NO2 is described. The model suggests how some of the features that define emphysema in man may occur. Twenty-one month-old rats were exposed to concentrations of 0.8 ppm of NO2, a level already achieved in smog. They and an equivalent control group lived out their natural lives of 2-3 years and died of similar commonplace diseases of old age apparently unrelated to NO2 exposure. The only difference between the groups was a sustained tachypnoea of about 20% above normal in rats exposed to NO2. Microscopically, lungs were essentially without blemish except for occasional evidence of bronchial epithelial changes. A similar experiment with 2 ppm of NO2 produced the same results. The bronchial epithelial cells exposed to NO2 were more uniform in size and the lumenal surfaces were smoother than in the controls. Functionally, it was suggested that inhaled particles, infectious or not, might be retained due to deficient ciliary cleansing of alveoli and bronchioles. The next higher concentration, 4 ppm, was terminated after 16 weeks. Grossly, the lungs were not clearly different from the controls, but the terminal bronchiolar epithelium was hypertrophic, characterized by increased height and uniformity of the cells. In all cases, continuous breathing of 10 ppm NO2 gave rise to large, air-containing lungs that did not collapse under atmospheric pressure. Animals exposed to 10 ppm began to die of respiratory failure after 16 months. They grew less well and developed thoraces with increased anterior-posterior diameters. Lungs of rats dying of exposure to 12 or 25 ppm NO2 looked alike, except that the longer survival of 16-30 months of the former allowed changes in them to become more advanced than in rats that died after 5-6 months from 25 ppm. It was concluded that by selective timing and dosage of NO2, lesions of the lung may be achieved that resemble more closely the generalized destructive, bullous-forming stage of the disease recognized by many pathologists as the determining symptom of terminal emphysema in man.

14493

Chen, C., K. Okamoto, and T. Nakajima

THE HISTOPATHOLOGICAL STUDY ON THE LUNG OF MICE EXPOSED TO 0.7-0.8 PPM NO2 GAS FOR A MONTH. (NO2 gas (0.7-0.8 ppm) ni renzoku ikkagetsukan bakuro shita mausu hai no byori soshiki gaku teki kenkyu). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hyg.), 24(1):91, April 1969.

To study the effect of exposure to nitrogen dioxide gas on lungs and trachea, mice four weeks of age were placed in a exposure chamber and continuously exposed for 30 days to 0.7 to 0.8 ppm concentrations of nitrogen dioxide gas, supplied by heating liquid NO2. Air for dilution was passed through a dehumidifier, filter, and activated carbon. Air velocity in the chamber was 5 cm/sec, temperature 24 to 26 deg, relative humidity 40 to 70%, and the light transmission rate of dust was less than 1%. The mice were given ample food and water. A control group of mice was raised under similar conditions but in the absence of NO2. No statistically significant difference in growth rate was observed between groups. On the 15th day of exposure to the gas, accelerated secretion of mucus, degeneration, and desquamation were observed at the mucus epithelium of the trachea. Lung congestion and increased secretion of mucus in bronchial tubes was also noted. By the 30th day, advanced negative and degeneration of the mucus epithelium was evident in both lungs and trachea. The results show that catarrhal changes in lung and trachea occur following exposure to less than 1% (sic; 1 ppm/) NO2 gas.

14553

Ichinosawa, A., H. Takahashi, Y. Tsunetoshi, and T. Shimizu

ETIOLOGICAL CONSIDERATIONS WITH RESPECT TO CHRONIC BRONCHITIS IN JAPAN. (Honpo ni okeru mansei kikanshien no byoin-teki kosatsu). Text in Japanese. Nippon Rinsho (Japan Clin.), 25(9):2054-2063, Sept. 1967. 34 refs.

The etiological influence of air pollution on the incidence of chronic bronchitis is discussed. Six areas in Osaka and its vicinity were classified into three severely, one moderately, and two mildly polluted areas. Concentrations of SO2, NO2, and ozone and amount of settling dust were measured. Incidence of chronic bronchitis in the severly polluted areas was higher (twice as great in males and three times as great in females) than that in the mildly polluted areas. Males were more frequently and severly involved than females. Smoking and SO2 concentration were the most important causes of this disease in any district, and the correlation between the concentration of SO2 and occurrence of chronic bronchitis was demonstrated mathematically. In younger age groups, certain constitutional factors influence the occurrence of the disease, while in older age groups, environmental factors are more influential. It was difficult to determine the minimal predisposing conditions necessary to provoke chronic bronchitis, since there were so many variations in physical conditions among the subjects.

15042

Los Angeles County Med. Assoc. Calif.

REPLY BRIEF OF THE LOS ANGELES COUNTY MEDICAL ASSOCIATION. (Presented before the U. S. Federal Power Commission in the Matters of Transwestern Pipeline Co., Docket nos. CP63-204, CP64-91; El Paso Natural Gas Co., Docket no. CP64-76; and Gulf Pacific Pipeline Co., Docket no. CP63-223, 25 p., Aug. 2, 1965.)

In arguing against oil producers and in favor of increased availability of sufficient supplies of natural gas to end industrial fuel-oil burning, it is pointed out that not only sulfur oxides but nitrogen oxides, sulfates, and submicron particulate matter, are contaminants derived from oil burning, and that these emissions constitute a serious health hazard. Industrial hygiene exposure limitations are not considered applicable to exposure of the general population to ambient air, and no single research experiment or epidemiological study can establish that a particular concentration is a safe level under any and all circumstances. In addition, it is felt that California state standards do not establish a safe atmospheric limit for community air pollutant concentrations and require modification in the light of recent findings. Los Angeles levels of SO2, NO, and particulates are considered harmful despite selected monthly averages showing 'harmless' levels; such monthly averages do not present a true picture of pollutant concentrations to which a population has been exposed. Clinical and epidemiological evidence indicates that present levels of air pollution in Los Angeles pose a serious risk to public health; it is believed that such considerations demand the elimination of pollution from industrial fuel oil burning.

15215

Freeman, G., S. C. Crane, and N. J. Furiosi

HEALING IN RAT LUNG AFTER SUBACUTE EXPOSURE TO NITROGEN DIOXIDE. Am. Rev. Respirat. Disease, 100(5):662-676, 1969. 13 refs.

The nature of healing was observed in rats after 1, 4, 10, 16, and 20 weeks of continuous exposure to 15 + or - 2 ppm nitrogen dioxide. Animals from each group were allowed to recover for 0, 8, 20, and 52 weeks and were compared with control rats of the same age. Lung weights increased at two different times as compared with those of the control animals. The first was associated with hypertrophy of bronchiolar and adjacent alveolar epithelium. This tended to return toward normal during recovery. The second occurred in aging, recovering rats, long after contact with NO2 had ceased. This was consistent with an increase in the staining property of collagen and elastic tissue in the alveolar parenchyma, which was most noticeable in the ductal areas. Between the two increments, lung weights were equivalent to those of control animals. Healing in the longer-exposed rats left some inhomogeneity of the air spaces of the parenchyma and some partial or possibly complete closure by fibrosis of the terminations of the bronchioles. Septal walls were sometimes attenuated and fractured. Both atresia of terminal bronchioles and discontinuities in altered elastic tissue may account in part for the apparently reduced elastic recoil of lungs of exposed animals. (Author summary modified)

15490

Holland, George J., David Benson, Albert Bush, George Q. Rich, and Robert P. Holland

AIR POLLUTION SIMULATION AND HUMAN PERFORMANCE. Am. J. Public Health, 58(9):1684-1691, Sept. 1968. 35 refs.

The effect of short-term exposure to moderate levels of photochemical air pollutant constituencies on the efficiency of various types of human motor performance was determined. Reaction time, vital capacity, and submaximum work performance on the bicycle ergometer were measured in 14 college student volunteer subjects. The subjects were randomly assigned to one of two groups according to the Latin square method of experimental design. They served alternately on two occasions as either control subjects in a normal atmospheric environment or as experimental subjects in an air pollution environment. In order to simulate the conditions of the Los Angeles Basin, a test facility was designed. Irradiated exhaust gases from an automobile were pumped into an exercise booth near the reaction tunnel. A ventilation system was used to replace the exhaust gases with filtered atmospheric air during the control experiments. Air samples were analyzed for carbon monoxide, carbon dioxide, nitric oxide, nitrogen dioxide, oxidants, hydrocarbons, aldehydes, and formaldehyde. It did not appear from the study that the performance of fine neuromuscular tasks such as reaction time or cardiorespiratory work efficiency were significantly altered by short-term exposure to moderate levels of air pollution. More study is required to elucidate the effects of air contaminants on other types of human psychomotor performance, especially maximum work capacity. Many atmospheric pollutants may have an insidious qualitative biochemical effect on human physiological processes which can only be identified through careful longitudinal study. Future studies involving higher levels of contamination with more precise measures of airway resistance are recommended.

15680

Yokoyama, Eiji

A COMPARISON OF THE EFFECTS OF SO_2, NO_2, AND O_3 ON THE PULMONARY VENTILATION OF GUINEA PIGS. (SO_2 to NO_2 oyobi O_3 no kankino moyobosu eikyo no hikaku-monumotto no okeru bakurojikken). Text in Japanese. Sangyo Igaku (Jap. J. Ind. Health), 11(11):563-568, Nov. 20, 1969. 21 refs.

Ventilatory functions of guinea pigs were quantitatively measured before, during, and after 2-hour exposure to SO_2, NO_2, and O_3. The gases caused an increase in the flow resistance of the animals, although the degree of change varied for the three gases. A significant difference was observed in the direction of change in the respiratory rate. Sulfur dioxide caused a decrease in the respiratory rate while NO_2 and O_3 caused a decrease. The tidal volume changed in a direction opposite to the change in the respiratory rate. The changes in the ventilation function of the respiratory system were attributed to differences in lung area between exposures. (Author abstract modified)

15732

Won, William D. and Harold Ross

REACTION OF AIRBORNE RHIZOBIUM MELILOTI TO SOME ENVIRONMENTAL FACTORS. Appl. Microbiol., 18(4):555-557, Oct. 1969. 9 refs.

The laboratory findings on the behavior of airborne R. meliloti (102F5) in relation to relative humidity (RH), ultraviolet light radiation, and certain common gaseous atmospheric pollutants were reported. Survival of R. meliloti in aerosols at 20 C was maximal at high RH and minimal at low RH. Relatively high concentrations of nitrogen dioxide, sulfur dioxide, or formaldehyde were needed to significantly reduce viability of R. meliloti in aerosols at 50% RH. Except for the reduction in activity of formaldehyde by SO_2, there was no additive or antagonistic effect of mixing pollutants. High environmental RH enhanced bactericidal activity of NO_2 and SO_2. High RH minimized and low RH accentuated the biological effect of ultraviolet light of 300 to 400 nm wavelength. (Author abstract modified)

15747

Belanger, William E.

A STUDY OF THE EFFECTS OF AIR POLLUTION ON HOSPITAL ADMISSIONS. Preprint, Philadelphia Dept. of Public Health, Pa., Air Management Services Div., 8p., Sept. 1969. (Presented at Air Pollution Committee Meeting, Philadelphia County Medical Society, Philadelphia, Oct. 27, 1969.)

A preliminary study on the effects of air pollution on health was conducted. Total oxidants, soiling index, sulfur dioxide, and nitrogen oxides were measured near the hospital. Hospital data were drawn directly from the patient-card files. Hospital admissions, after elimination of admissions not directly concerned with pollution effects, were broken into total respiratory admissions, respiratory infections only, respiratory infections including undiagnosed cases, respiratory growths, total respiratory for children under 10, total respiratory for adults over 60, eye irritation, cardiac patients, and vascular patients. Sixty-three visual comparisons yielded one very strong correspondence between soiling index and total respiratory admissions. An additional relationship between sulfur dioxide and total respiratory admissions was weak. The breakdown of respiratory admissions into subcategories yielded numbers of admissions too low to make a comparison, and so the prediction of the sensitive areas of the population was not possible. Coefficients of correlation were calculated for individual months for total respiratory admissions against air pollution variables. Data showed significant correlations for soiling index, sulfur dioxide, and nitrogen oxides. The correspondence between soiling index and respiratory admissions was especially marked. This effect occurred as low as 0.75 COH. It was apparent that the correspondence of soiling index peaks and peaks in respiratory admissions should be further investigated. It was recommended that the soiling index be related to air quality standards with a maximum of about 0.75 COH.

EFFECTS—PLANTS AND LIVESTOCK

00009

O. C. Taylor

"OXIDANT" AIR POLLUTANTS AS PHYTOTOXICANTS. California Univ., Riverside, Air Pollution Research Center. (Paper 64-91). 1964. 13 pp.

This report attempts to outline some of the advances made in the identification and study of oxidizing toxicants other than ozone in the "smog" complex and to indicate some of the avenues of research that are prerequisites to the establishment of effective control measures. Assuming that the total elimination from the atmosphere of oxidant-forming pollutants is not economically feasible, it is essential that investigations be continued to determine acceptable levels of the pollutants, to find resistant plant materials and to search for chemical additives that might offer protection to the vegetation.##

00229

J.T. Middleton A.J. Haagen-Smit

THE OCCURRENCE, DISTRIBUTION, AND SIGNIFICANCE OF PHOTOCHEMICAL AIR POLLUTION IN THE UNITED STATES, CANADA, AND MEXICO. J. Air Pollution Control Assoc., 11(3):129-134, Mar. 1961. (Presented at the 53rd Annual Meeting, Air Pollution Control Association, Cincinnati, Ohio, May 22-26, 1960.)

The cracking of rubber, production of elevated oxidant and the occurrence of both ozone and oxidant plant damage are shown to be manifestations of photochemical air pollution. Geographic areas considered are Los Angeles, San Francisco, Washington, D.C.; urban and non-urban areas.##

00244

H.W. Wolf

MICROORGANISMS AND OXIDIZING - TYPE AIR POLLUTION (DOCTOR'S THESIS). (For the degree of Doctor of Public Health, California Div. Los Angeles.) 1965. 119 pp.

The possibility that oxidizing-type air poullution might suppress the viability of bacterial cells was investigated. Sampling activities were conducted at the Azusa Station of the Los Angeles County Air Pollution Control District. Micoorganisms indigenous to the air of the area were sampled with an Andersen sampler. Bacteria and yeasts (together) recovered during high-oxidant periods (total oxidant = greater than 0.19 ppm) had a median equivalent diameter (MED) 0.3 microns greater than those recovered during low-oxidant periods (total oxidant equal to or less than 0.19 ppm). This difference was not considered significant since wind velocity was higher during high-oxidant periods. Higher wind velocities effect a longer MED by increasing the relative concentration of large-sized particles. Although more organisms were recovered on the small stage during low-oxidant periods than during high-oxidant periods, the level of significance (0.85) is low. Further, it was speculated that sunlight might exert such an effect. Background studies showed gram-negative rods to be highly log-normal in size distribution, while gram-positive rods deviated from normality. This deviation of gram-positive rods was possibly due to the predominance of two morphological types, large spore-formers, and small non-spore-formers. Molds, including actinomycetes, were markedly non-normal in distribution. The highly log-normal distribution, and absence of spore-forming types, of the gram-negative rods deserve special attention from future investigators. A permeable-membrane technique was used to expose selected microorganisms to high-oxidant levels. (Author's abstract)##

00301

.. D. Thomas

GAS DAMAGE TO PLANTS. Ann. Rev. Plant Physiol. 2, 293-322, 1951.

A detailed review is given of gas damage to plants with references containing important bibliographies. Investigations on the effects on vegetation of sulfur dioxide, other sulfur-containing gases, halogens and hydrogen halides, nitrogen oxides, ammonia, mercury vapor, and carbon compounds are cited and results discussed. Phytotoxicities of the different gases seem to depend on (a) absorbability, which is related to water solubility and reactivity with the tissues; (b) acidity or alkalinity; (c) oxidation or reduction reactions; (d) hormonal properties; and (e) toxicity of the element itself. Carbon monoxide, hydrogen cyanide and hydrogen sulfide are of comparatively low toxicity. Greater toxicity is evidenced by chlorine and sulfur dioxide due to their rapid oxidizing or reducing properties. The even greater toxicity of fluorine and iodine compounds is due to their rapid absorption and inherent toxicity as elements in themselves.##

00316

A. P. Gregory

EFFECTS OF AIR POLLUTION ON EDIBLE CROPS. North Carolina Univ., Chapel Hill, Dept. of Environmental Sciences and Engineering. May 1964. pp. 21-3.

The effects of air pollution on edible crops should be differentiated at the onset from the effects of air pollution on vegetation in general. For example, sulfur dioxide has a very pronounced effect on pine needles, but pine needles are a minor food source. It has been variously estimated by different authorities that the annual loss of vegetable produce amounts to 40 to 60 million dollars. Although this over-kill type of damage is very real to the vegetable producer and is of great economic interest, it is of less concern to those in public health. Their concern is with the damage that alters the content s of crops but does not alter the appearance sufficiently to prohibit their sale. This results in threats to public health through the insidious route of the gastro-intestinal tract. The alterations in edible crops that are usually not apparent to the consumer fall into two categories: (1) loss of nutiirnts such as vitamins, proteins, essential fatty acids, etc. and (2) the addition of some substance to the food which is toxic when absorbed from the gastro-intestinal tract. The loss of nutrients has been established in many cases. Some of the substances which have been shown to produce nutrient damage to produce are: ozone, nitroolefins, perocyacyl nitrates, nitrogen oxides, and ethylene. Of probably greater importance to health now and assuredly in the future is the addition of some toxic substance to the produce. With the advent of possible atomic power plants, Be was studied for toxicity and found to be extremely toxic. It was found that Be taken up into bush beans was not only toxic itself, but decreased the Cu content. In this way it fell into the category of primary toxicant and also into the category of nutrient depletor. Many other compounds also fall into both categories. With the many new insecticides, herbicides and larvicides being manufactured, it has become imperative to be aware of the problem of both the effect on edibles of a toxicant and also its effect on the plant, that is, loss of minerals, vitamins, etc.##

00696

A. F. W. Cole and M. Katz

SUMMER OZONE CONCENTRATIONS IN SOUTHERN ONTARIO IN RELATION TO PHOTOCHEMICAL ASPECTS AND VEGETATION DAMAGE. J. Air Pollution Control Assoc. Vol. 16(4):201-206, Apr. 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada. June 20-24, 1965, Paper No. 65-113.)

This paper describes an air pollution investigation at Port Burwell, Ontario to determine the pollutant responsible for fleck damage. The study was part of a cooperative project with groups representing the Canada Department of Agriculture, the Meteorological Branch of the Canada Department of Transport, the Air Pollution Control Branch of the Ontario Department of Health, and Imperial Tobacco Co. of Canada Ltd. In 1960 and 1961 the air pollution phase of the project was undertaken by the Occupational Health Division of the Department of National Health and Welfare.##

00961

I. J. Hindawi and A. P. Altshuller

PLANT DAMAGE CAUSED BY IRRADIATION OF ALDEHYDES. Science 146(3643):540-542, Oct. 23, 1964.

The report that damage to petunia has been correlated with the presence of aldehydes in the atmosphere is discussed in relation to recent laboratory findings. Laboratory investigations have shown that irradiation of formaldehyde in air will not cause plant damage to the varieties of petunia, pinto bean, and tobacco wrapper used, even when nitrogen oxide is added to the system. Irradiation of propionaldehyde in air does cause damage to these plants. Addition of nitrogen oxide to the irradiated propionaldehyde-in-air system does not markedly increase damage. (Author abstract)##

00963

Taylor, O. C., and F. M. Eaton

SUPPRESSION OF PLANT GROWTH BY NITROGEN DIOXIDE. Plant Physiol. Vol. 41:132-135, 1966. 9 refs.

Nicotiana glutinosa and pinto bean seedlings (Phaseolus vulgaris) were exposed for short periods (3 days or less) to high concentrations of NO2 (4.11-20.53 mg/cubic meter) to compare the resulting leaf lesions with ozone damage produced at concentrations of 0.43 to 0.86 mg/cubic meter. Although the same physiological age leaf tissue was damaged by both toxicants, damage caused by NO2 was unlike that caused by ozone. Pinto bean (Phaseolus vulgaris) and Pearson improved tomato (Lycopersicon esculentum) seedlings were continuously exposed for 10 to 22 days, to low concentrations of NO2 (less than 1.03 mg/cubic meter). These exposures caused significant growth suppression, increase in green color (total chlorophyll content), and distortion of leaves. (Authors' summary)##

01665

I.A. Leone, E. Brennan, R.H. Daines

WHAT IS IN NEW JERSEY AIR THAT CAUSES PLANT DAMAGE? New Jersey Agr. 44, 11-3, Aug. 1962

Air samples were taken in Carlstadt, Bordentown and at New Brunswick, and SO2,O3 and NO2 were determined daily during a 4-hr period. With regard to SO2, Carlstadt was the most polluted, New Brunswick next, and Bordentown had the lowest pollution. In Carlstadt and New Brunswick SO2 often exceeded 0.1 ppm which is believed to cause damage to alfalfa, violets and crab apple. In all three locations O3 frequently exceed the 0.035 ppm which causes fleck on tobacco and other more sensitive plants. NO2 is a constituent of some of the photochemical reactions which produce material toxic to plants. High barometric pressure and low wind speed are associated with an increased air pollution load.##

01809

J.T. Middleton

TRENDS IN AIR POLLUTION DAMAGE. Arch. Environ. Health 8, 19-23, Jan. 1964. (Presented at the Sixth Annual Air Pollution Medical Research Conference, San Francisco, Calif., Jan. 28-29, 1963.)

Plant damage from particulates, oxidants, ozone, ethylene, fluoride and sulfur dioxide are discussed. The trends in California are emphasized. The relevant literature is reviewed.##

02209

W.M. Dugger, Jr., O.C. Taylor, E. Cardiff, C.R. Thompson

STOMATAL ACTION IN PLANTS AS RELATED TO DAMAGE FROM PHOTOCHEMICAL OXIDANTS. Plant Physiol., 37, 487-91, 1962.

The role of stomates, as a factor in controlling the injury to plants from the photochemically produced pollutants, ozone and peroxyacetyl nitrate (PAN), was investigated. Stomatal action was quantitatively measured by determing the resistance of air flow through the stomates with a Wheatstone bridge resistance porometer. By a combination of measurements involving apparent photosynthesis, transpiration, and degree of leaf damage produced by the air pollutant oxidants it was shown that: (A), Stomates open rapidly in the light, even after a long dark period, and close slowly in the dark; (B), Transpiration rate from plants transferred from the dark to the light equals the rate of control plants in the light within 30 minutes; (C , The physiological age of bean plants and not the degree of stomatal opening determines the susceptibility to the two oxidants. Five and six day old bean plants are not damaged by ozone yet the stomates are functional. Plants of this age are most susceptible to PAN damage; (D), Apparent photosynthesis and degree of stomatal opening are not significantly reduced in pinto bean by a 30 minute fumigation with ozone. The length of the pre-fumigation dark period determines the extent of leaf damage from this pollutant. The nature of ozone damage and the protective action of a long pre-fumigation dark period suggest that the level of carbonhydrates in the leaves has some role in predisposing plants to damage from this oxidant. (Author summary)##

02299

J.T. Middleton

PLANT DAMAGE: AN INDICATOR OF THE PRESENCE AND DISTRIBUTION OF AIR POLLUTION. Bull. World Health Organ. (Geneva) 34, (3) 477-80, 1966.

Air pollutants may damage plants and cause death or destruction of tissue with visible pathological symptoms, reduce growth, productivity, and commodity quality, and interfere with biological processes without causing visible injury symptoms. The contaminants responsible for damage may be either particulate or gaseous in nature. The solid particles released into the atmosphere are sometimes the cause of soiling of fruits and vegetables, tissue damage to exposed leaves and fruits, growth reduction; in addition, they add a toxic burden to forage crops used as feedstuffs for livestock. Liquid particles, such as acid aerosols and toxic mists, are sometimes responsible for leaf spotting. The greatest amount of damage to animals and vegetation is usually caused by gaseous air contaminants, which directly injure plants and indirectly injure animals by the toxic effects produced after the animal has consumed contaminated forage and food supplements. This discussion of plant damage symptoms and responses has been directed to the qualitative aspects necessary for assessing the presence and distribution of pollution. As to the evaluation of the concentration and duration of exposure to specific pollutants, experimental systems are available, or can be designed, to meet these specific quantitative needs once the presence of given pollutants has been determined.##

03292

F. F. Burleson, E. R. Stephens, and E. A. Cardiff.

THE PRODUCTION OF PURE PEROXYACYL NITRATES. Preprint. (Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif., Jan. 6-7, 1964.)

Some naturally occurring photochemical products of "smog" were first identified as "compound X" by Stephens et al in 1956. In 1960, the first member of the series was recognized as peroxyacetyl nitrate (PAN) by Stephens et al. The C3 homologue, peroxypropionyl nitrate (PPN) was reported in synthetic mixtures by Stephens in 1961. Both the C2 and C3 homologues were detected in ambient air by Darley et al in 1963. only from synthetic preparations. The first 3 organic N compounds have been synthesized and purified at the Air Pollution Research Center, University of California, Riverside, for the past several years. Plant fumigations have demonstrated that these compounds are capable of inducing injury symptoms indistinguishable from those caused by photochemical smog. They are also powerful eye irritants. They have been identified (as a class) in artificially irradiated dilute auto exhaust, and in artificially irradiated mixtures of realistic concentrations of pure hydrocarbon plus oxides of nitrogen. The three purified synthetics have been used in plant fumigation tudies, in eye irritation studies, in physical and chemical studies designed to confirm the structure of the compounds, and in instrument design and calibration. The principal problem in this preparation is the extreme instability of these compounds.##

03395

M.D. Thomas

EFFECTS OF AIR POLLUTION ON PLANTS. World Health Organ. Monograph Ser. 46 (Air Pollution), 1961. pp. 233-78.

The literature on the effects of air pollution on plants has been reviewed with special reference to those pollutants that present major problems - viz., SO2, HF, London type smog, and Los Angeles type smog. The others, which are definitely of minor importance, are referred to more briefly. SO2 has long been recognized as an air pollutant because it arises from the combustion of nearly all fuels, especially coal, and from the roasting of sulfide ores. It is phytotoxic in concentrations above 0.1 x 0.2 p.p.m., depending on the length of exposure. Below about 0.4 p.p.m., the gas tends to be oxidized in the cells as rapidly as it is absorbed, and interference with functions such as photosynthesis is slight. Toxic concentrations of sulfate are finally accumulated. Chronic rather than acute injury, if any, is generally manifested with these small concentrations. Above about 0.4 p.p.m., acute injury occurs more frequently, owing to the reducing properties of sulfate in the cells. Temporary interference with photosynthesis or "invisible injury" can occur to some extent, but these concentrations cause acute injury if maintained for more than short periods, and recovery is rapid when the fumigation is stopped. HF behaves somewhat similarly to SO2, except that with a few species of plants it is effective in causing lesions and interfering with photosynthesis in concentrations 2 or 3 orders of magnitude smaller than in the case of SO2. With most species it is up to 10 times as effective as SO2. Fluoride accumulated in the cells in sublethal amounts interferes with photosynthesis as does sulfite, but whereas the latter is deactivated by simple oxidation to sulfate, the former must be removed by translocation, volatilization, or some obscure chemical reaction, which makes much slower the recovery of the plant functions after HF fumigation. There appears to be a concentration of HF for each species below which "invisible injury" does not occur. The Los Angeles type smog is fairly well understood as to its mode of formation and its phytotoxic effects, but the actual compounds that cause these effects are still unknown. The smog causes characteristic leaf lesions which are quite different from those produced by other pollutants, including ozone, which may be a constituent of the smog. It also causes some "invisible" injury. Visible damage to crops in Southern and Northern California was estimated at over $5 000 000 and $1 100 000 respectively, annually, in 1956. (Author summary modified)##

03596

E. F. Darley, W. M. Dugger, J. B. Mudd, L. Ordin, O. C. Taylor, and E. R. Stephens

PLANT DAMAGE BY POLLUTION DERIVED FROM AUTOMOBILES. Arch. Environ. Health 6, 761-70, June 1963. (Presented at the Fifth Session, Air Pollution Research Conference on "Effects of Motor Vehicle Emissions on Visibility and Vegetation," Los Angeles, Calif., Dec. 6, 1961.)

Emissions from motor vehicles are now known to be the principal source of the raw materials contributing to photochemical air pollution in California. Some of the products of the reaction, ozone, peroxyacyl nitrates, and the unidentified products of ozone-olefin reactions, are very damaging to the leaves of a variety of crop plants. The injury that was once confined to Los Angeles County now occurs in many states and causes economic loss estimated in excess of $25,000,000 annually. Ethylene, one of the compounds found in the exhaust, is also very injurious to several crops. The ability of a given toxicant to incite injury is dependent on the age of the leaf and the conditions of illumination under which the plant is grown prior to, during, and after fumigation. In addition, the growth of plants, even in the absence of visible injury, is materially affected. Evidence is presented to indicate that the chemical and physical systems within the plant are disrupted by the phytotoxicants. (Author summary)##

03615

J. T. Middleton

PHOTOCHEMICAL AIR POLLUTION DAMAGE TO PLANTS. Ann. Rev. Plant Physiol., No. 12:431-448, 1961.

The toxic components in photochemical air pollution are typically the oxidation products of hydrocarbons and result either from the dark reaction of ozone and olefins or the photolytic reaction of nitrogen oxides and hydrocarbons in the presence of sunlight. This paper describes the occurrence and distribution of photochemical air pollution, enumerate some of the raw materials and products of these oxidation systems responsible for plant damage, and indicate the biochemical, physiological, and pathological effects of these contaminants upon plants.##

03618

E. R. Stephens, E. F. Darley, O. C. Taylor, W. E. Scott

PHOTOCHEMICAL REACTION PRODUCTS IN AIR POLLUTION. Intern. J. Air Water Pollution 4, (1/2) 79-100, 1961. (Presented at the

25th Midyear Meeting, American Petroleum Inst. Division of Refining, Detroit, Mich., May 11, 1960.)

When low concentrations of simple olefins and nitrogen oxides in air are irradiated with artificial sunlight, the olefin molecule splits at the double bond. One end forms a carbonyl compound, and the other yields a variety of products. Among these is a highly oxidized, unstable organic nitrogen compound previously described as compound X or peroxyacetyl nitrite (PAN) and detected in polluted atmospheres. This compound has now been purified by gas chromatographic techniques, and its chemical, physical, and physiological properties have been examined. At concentrations well below 1 p.p.m. in air, this compound produces damage symptoms on plants, similar to those observed from oxidant air pollution but different in some respects from the phytotoxicant from ozone-olefin reactions. PAN is the first pure compound isolated from photochemical reaction mixtures which has been found to produce the characteristic oxidant damage symptoms. It is also a strong eye irritant at concentrations in the 1 p.p.m. range and is therefore probably responsible, along with acrolein and formaldehyde, for the eye irritation in photochemical air pollution. (Author abstract)##

04256

M. S. Burakhovich

ATMOSPHERIC POLLUTION BY DISCHARGES FROM CHEMICAL PLANTS. (Zagryaznenie atmosfernogo vozdukha vybrosami khimicheskikh predpriyatii.) . Hyg. Sanit. 31, (9) 437-40, Aug. 1966. Russ. (Tr.)
   CFSTI: TT 66-51160/7-9

The purpose of the investigations was the determination of one-time concentrations of injurious substances in the ambient air of populated areas within a radius of 3000-4000 m. from two chemical plants. Among the substances included in the determinations were: nitrogen oxides, methanol, ammonia, hydrogen sulfide, formaldehyde, and cyclohexane. The effect of emissions from a power plant, on coniferous forests, was also studied. Needles from dried trees contained greater concentrations of sulfur compounds than needles from healthy trees.##

05342

Darley, E. F., Nichols, C. W. and Middleton, J. T.

IDENTIFICATION OF AIR POLLUTION DAMAGE TO AGRUCULTURAL CROPS. (AIR POLLUTION RESEARCH REVEALS CHEMICAL TOXICANTS INJURING VEGETATION IN POPULOUS AREAS OF CALIFORNIA.) Calif. Dep. Agri. Bull., 55(1):11-19, 1966.

The subject of this paper is the damage air pollution does to the plants that feed us, clothe us and please our aesthetic sense.

This damage is considerable. Estimates of visible damage to agrucultural crops amount annually to about $8 million in California and approximately $18 million along the Atlantic seaboard. Damage to vegetation has increased with industrialization and urban development. Several decades ago sulfur dioxide and fluorine were recognized as the principal plant toxicants. These two gases continue to be very important but within the last 20 years a new group of toxicants has been identified. These are products of atmospheric photochemical reactions between hydrocarbons and nitrogen oxides. The principal products of these reactions are ozone and the peroxyacyl nitrates (PANs). The distribution of plant damage in California shows that it occurs only in recognized geographical areas which, in each instance, are located within airsheds. Because damage to plants is often the first indication of air pollution, it is important that the surveillance of pollution damage to agriculture be continued. Such information will help communities, in their planning, to take cognizance of the relationship between the air ressource and the community needs for commercial and industrial development, energy production, fuel usage and transportation, agriculture, and forest and recreation land. The air contaminants responsible for damage may be either particulate or gaseous in nature. The greatest amount of damage to animals and vegetation is usually caused by gaseous air contaminants which directly injure plants and indirectly injure animals by the toxic effects produced after the animal has consumed contaminated forage and food supplements.

05344

Darley, E. F., and Middleton, J. T.

PROBLEMS OF AIR POLLUTION IN PLANT PATHOLOGY. Ann. Rev. Phytopathol. 4, 103-18, 1966.

Air quality affects plant growth and development. Whereas oxygen is necessary for aerobic plant respiration and carbon dioxide is necessary for photosynthesis in green plants, a number of pollutants may alter plant metabolism and incite disease. It is the purpose of this paper to enumerate some of the principal air pollutants which adversely affect plant growth and reproduction, to describe the diseases incited by them, and to identify some of the problems of air pollution in phytopathological research. A primary responsibility of the pathologist is to alert agriculturists of impending air-pollution problems, so that social action may be taken to insure the continued productivity of crop, pasture, and forestry enterprises. Another responsibility, because plants are early indicators of an air pollution problem, is to assist public health and resource agencies in the planning, conduct, and evaluation of air-pollution abatement programs. Plant pathologists must become increasingly concerned with the effects of air quality on plant growth.

05420

Daines, R. H., I. A. Leon, and E. Brennan

AIR POLLUTION AND PLANT RESPONSE IN THE NORTHEASTERN UNITED

STATES. In: Agriculture and the Quality of Our Environment. Brady, N. C. (ed.), American Association for the Advancement of Science, Washington, D. C. AAAS-Pub-85, p. 11-31, 1967. 56 refs. (Presented at the 133rd Meeting, American Association for the Advancement of Science, Washington, D. C. Dec. 1966.)

A review of pollutants that have been found to elicit plant response is confined to the discussion of acid gases, primary products of combustion, and products of reactions occurring in the atmosphere. Other topics discussed include: plant response as an indicator of meteorological conditions and the fuels used for heat, light, and power.##

05421

Merriman, G. M.

FLUORIDES AND OTHER CHEMICAL AIR POLLUTANTS AFFECTING ANIMALS. In: Agriculture and the Quality of Our Environment. Brady, N. C. (ed.), American Association for the Advancement of Science, Washington, D. C. AAAS-Pub-85, p. 91-95, 1967. 11 refs. (Presented at the 133rd Meeting, American Association for the Advancement of Science, Washington, D. C., 1966.)

A review of air pollution problems involving animals is presented. One pattern of procedures useful in investigating and controlling the effects of chemical air pollution upon animals was developed during United States and British studies of effects of fluoride effluents upon cattle. Generally the effluents collected upon the surfaces of vegetation and exerted their effects only after ingestion by animals. The investigational procedures included methods of detecting pollutant effects upon animals, diagnosis and evaluation of effects, consideration of pollutant sources, and pollutant control as related to animal well-being. All procedures depended on research with laboratory and farm animals.##

05485

W. M. Noble

AIR POLLUTANTS. Lasca Leaves. 15 (1), 7-16 (Jan. 1965).

After years of careful study, some of the components of smog have been sorted out. The more important ones, their effects on vegetation, and a list of sensitive and resistant plants are discussed. The components are peroxyacetyl nitrate, ozone, ethylene, hydrogen fluoride, sulfur dioxide and aerosols.##

05558

H. A. Rodenhiser

EFFECTS OF AIR POLLUTION ON CROPS AND LIVESTOCK. Preprint.

(Presented at the National Conference on Air Pollution, Washington, D.C., Dec. 10-12, 1962, Paper D-3.)

The damage done by air pollutants is costly both to farmer and consumer. The sensitivity of plants and trees to various pollutants (fluoride, sulfur dioxide, PAN, and nitrogen oxides) is discussed, with emphasis on current and future research efforts to erradicate these pollutants. Although there is no good measure of the total national loss from air pollution, fugures have been published for some localties. In Southern California, for example, loses of vegetation due to oxidants are thought to be around 10 million dollars a year. This includes only the readily demonstrated loses of vegetable crops downgraded because of markings or left unpicked in the field. The general conclusion is that air-pollution research in the field of agriculture must move ahead before a greater gap is created in this area.##

05610

W. W. Heck

PLANT INJURY INDUCED BY PHOTOCHEMICAL REACTION PRODUCTS OF PROPYLENE-NITROGEN DIOXIDE MIXTURES. J. Air Pollution Control Assoc. 14(7):255-261, July 1664. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963.)

Plants developed typical ethylene injury symptoms when fumigated for 21 to 48 hr with ethylene or various combinations of ethylene, acetylene, propylene and nitrogen dioxide. When propylene and nitrogen dioxide were included in the gas mixture and the mixture irradiated typical oxidant symptoms were recorded. Slight to severe necrotic spotting, due to nitrogen dioxide, was noted in a 48 hr fumigation at one ppm nitrogen dioxide and in a 21 hr fumigation at 3.5 ppm nitrogen dioxide. Twelve hour fumigations using irradiated mixtures of ethylene, acetylene and propylene at three concentrations (2,4, and 8 ppm) each in combination with one ppm of nitrogen dioxide gave typical oxidant damage with only the propylene-nitrogen dioxide mixtures. From reported oxidant injury symptoms the propylene-nitrogen dioxide irradiated mixture produced plant injury which is typical of both ozone and PAN. The presence of other phytotoxicants was not dicounted but the severity of injury, under the conditions used, made it difficult to evaluate other possible types of oxidant damage. The production of the phytotoxicants using various ratios of propylene-nitrogen dioxide mixes was determined using the plants as biological indicators. A ratio of one ppm NO2 to 2-3 ppm propylene produced the highest concentration of the phytotoxicants. The effects of varying light and temperature conditions during the fumigation period indicated that plants must be in the light before they are sensitive to oxidant damage and that a temperature above or below normal will reduce oxidant injury. Results stress the need for studying the interrelations of oxidant injury and various environmental factors. (Author's summary)##

05903

B. L. Richards, J. T. Middleton, and W. B. Hewitt

AIR POLLUTION WITH RELATION TO AGRONOMIC CROPS: V. OXIDANT STIPPLE OF GRAPE. Agron. J. 50, 559-61 (1958). (Presented at the 50th Anniversary Meeting, American Society of Agronomy, Nov. 20, 1957.)

Small, brown to black, discrete, punctate lesions occur on the upper leaf surface of grape grown in areas polluted by air-borne oxidants. The lesions are typically restricted to the palisade layer and may be easily distinguished from other grape disorders because of their stippled appearance. The disease can be incited in grape by fumigation with ozone. Toxic ozone levels occur in the polluted air mass above the Los Angeles and San Francisco areas where oxidant stipple is found. Stipple has not yet been seen in the grape producing areas in the Coachella, Napa, Sacramento, and San Joaquin valleys of California. Oxidant stipple can be distinguished from smog-type oxidant injury due to oxidized organics in that the upper leaf surface is stippled in grape and there is no common and pronounced silvering or glazing of the lower leaf surface as found on herbaceous crops and weeds in and adjacent to affected vineyards. Leaf injury to grape due to foliar fluoride accumulation can be readily distinguished because it is marginal red to brown in color, necrotic, and commonly exhibits zonate markings. Stipple can also be easily separated from foliar salinity and drought injury, both of which produce marginal and intercostal leaf necroses similar to those induced by fluorides. Although ozone occasionally may cause leaf injury to some plants particularly grasses, grown in areas receiving naturally polluted air, it is unusual to note ozone damage to agricultural crops; oxidant stipple of grape is, therefore, a unique disease both in its symptomology and etiology.##

06326

W. W. Heck, L. S. Bird, M. E. Bloodworth, W. J. Clark, D. P. Darling, and M. B. Porter

ENVIRONMENTAL POLLUTION BY MISSILE PROPELLANTS. Texas Agricultural and Mechanical Research Foundation, College Station. Apr. 1962, 120 pp. (Rept. MRL-TDR-62-38.)
CFSTI, DDC: AD 282984

The effects of 21 missile fuel components on aquatic organisms, soil microflora, plants and soils were determined. Goldfish and Daphnia were subjected to 0,1,10,100 and 1000 ppm of the test compounds for 72 hours in the aquatic studies. Some or all of 10 goldfish and 13 Daphnia died, when exposed to 100 ppm of the test chemicals. Counts of bacteria, actinomycetes, and fungi in the soil microflora studies showed no significant decrease in any of the organisms with a 100 ppm application of test chemical to the soil samples. Three of the chemicals may sterilize the soil of actinomycetes. Plant studies were threefold using squash, soybean, cotton, cowpea and corn; germination studies using 1000 ppm of each test chemical produced consistent inhibition of germination by two of the compounds and two ionic species; seedling studies using a soil drench of each test chemical at 100 ppm, produced toxic symptoms with three of the ionic components; seedling studies using three test chemicals (gases) at 100 ppm as air pollutants produced severe injury to death of all species with each of the test gases. Soil studies (1000 ppm) included the leachability and runoff potential of each test chemical as well as the effects on soil. (Author abstract)##

06498

L. Ordin, and B. Propst

EFFECT OF PHOTOCHEMICALLY PRODUCED OXIDANTS ON GROWTH OF AVENA COLEOPTILE SECTIONS. Plant Physiol., 36(3), 326-30, (May 1961).

Avena coleoptile sections incubated in solutions through which photochemically produced oxidant mixtures, ozone or peroxyacetyl nitrate (PAN) are passed, display subsequent repressed growth in fresh solutions to which auxin has been supplied. Treatment by oxidant recording as 1.4 ppm derived from an irradiated mixture of trans-2-butene and NO2 results in about 50% inhibition of elongation. About 1.5 ppm PAN also inhibits growth to the same degree or more. Approximately 170 ppm ozone produced comparable magnitudes of inhibition. In all cases basal respiration was inhibited little or not at all. Although the concentrations dealt with here are about tenfold above those found in the atmosphere (200-fold for ozone) the results may be helpful in the interpretation of mechanisms of growth inhibition in the field. There are probably several reasons why high concentrations of PAN are required to produce growth inhibition in Avena coleoptiles while much lower concentrations affect more sensitive intact plants. Although the coleoptile is cutinized and has few stomata, suggesting a transport barrier, there are indications that root tissue which is neither cutinized nor suberized to any great extent may be even less sensitive. Thus the answer is more likely to lie either in the resistance of the cellular membranes themselves to the uptake of the oxidants or in the presence of reducing agents in the cell or, simply, less sensitive enzyme systems. It was found that intact seedlings in the gas stream are not more sensitive than sections floating in water during gas exposure. The lack of illumination during exposure may also be a factor, since even sensitive petunia plants exposed in the dark to 0.5 ppm oxidant derived from an irradiated mixture were not damaged.##

06499

L. Ordin and B. Propst

EFFECT OF AIR-BORNE OXIDANTS ON BIOLOGICAL ACTIVITY OF INDOLEACETIC ACID. Botan. Gaz. 123(3), 170-5 (Mar. 1962).

This investigation concerns the effects of some of the known atmospheric pollutants, namely ozone, peroxyacetyl nitrate (PAN), and ultraviolet-irradiated mixtures of olefin and NO2 on indolacetic acid in vitro. It is apparent from the results that air-borne oxidants such as PAN and ozone can inactivate IAA in vitro. Whether such a mechanism of inactivation is of importance in the living plant cannot be answered fully at present. Ascorbic acid prevented the inactivation of IAA by chemically reducing the oxidant level in the solutions. The residual ascorbate, or its decomposition products, in the growth solutions exerted a slight subsequent inhibitory action on coleoptile growth. This observation does not agree with the results of other investigators. Since the concentration of ascorbate was much higher in the present experiments than that used by other investigators, it is possible that the growth-stimulating range was exceeded in the present investigation. The failure of IAA activity to recover despite low residual amounts of PAN or ozone in solution and, more particularly, despite the addition of ascorbate to the previously treated solutions indicates that the inactivation is not similar to that caused by H2O2 or peroxides. In the peroxide-induced inactivation, there is an apparent interference with the bioassay rather than an irreversible change. In the case of inactivation by ozone or PAN the change is irreversible as shown by the changes in ultraviolet spectra. Some light on this irreversible inactivation is shed by the ultraviolet spectra. They show that the change in IAA caused by ozone and PAN is probably a ring alteration.##

07786

Hansbrough, J. R.

AIR QUALITY AND FORESTRY. In: Agriculture and the Quality of Our Environment. Brady, N. C. (ed.), Norwood, Mass., Plimpton Press, AAAS-Pub-85, p.45-55, 1967. 25 refs. (Presented at Meeting, American Association for the Advancement of Science, Science, Washington, D. C., DEC. 1966.)

A review which cites examples of injury to forests by specific air pollutants. The source and the nature of the pollutants are discussed. Also, the contribution of trees in combating the air the 133rd. Meeting, American Association for the Advancement of pollution problem is speculated on. As technology changes, trees wherever they grow and for whatever purpose are increasingly subjected to toxic substances in the atmosphere. There is a considerable body of knowledge already available but it is dwarfed by the magnitude of what is not yet known. More information on the nature and source of air pollutants and their present and expected impact on our forest and shade tree resource is necessary.

10206

10206T
Haut, H. Van and H. Stratmann

EXPERIMENTAL INVESTIGATION OF THE EFFECT OF NITROGEN DIOXIDE ON PLANTS. Transaction of the Land Institute of Pollution Control and Soil Conservation of the Land of North

Rhine-Westphalia, Essen. ((Schriftenreihe der Landesanstalt fur Immissions- und Bodennutzungsschutz des Landes Nordrhein-Westfalen, Essen.)) Translated from German. No. 7:50-70, 1968. ((25)) refs.

The effect of NO2 on plants was studied. Because NO is always present wherever there is NO2, NO was also introduced into the exposure chambers containing test plants. Included in the tests were various dicotyledons, monocotyledons, conifers, and deciduous plants. Symptoms of damage included necrosis, chlorosis, striping, and spotting. The toxic tolerances of many plants are listed, along with specific damage symptoms for each. Effects of stage of growth and soil conditions are considered. The concentrations of NO2 which were damaging are compared to the toxic concentrations of SO2 which have been thoroughly studied in the past.##

12042

Heggestad, H. E.

DISEASES OF CROPS AND ORNAMENTAL PLANTS INCITED BY AIR POLLUTANTS. Phytopathology, 58:1089-1097, Aug. 1968. 80 ref.

Air pollution injury to crop and ornamental plants is increasing in the U.S.A. Estimates of annual losses to agriculture from air pollutants, which ranged from $150 to $500 million during the decade 1951-1960, are now $500 million. Although most of the loss is due to growth suppression or chronic injury, it is the acute injury that suggests the nature of the air pollutant and reveals the distribution of the problem. Each pollutant tends to produce its own pattern of injury, leaving graphic records of air pollution episodes. Photochemical oxidants, ethylene, sulfur dioxide, fluoride, and other pollutants produce marked reactions in various types of plants. The recent developments and current research trends in the assessment of these reactions are reviewed.##

12045

Johnson, H.

THE HIGH COST OF FOUL AIR. The Progressive Farmer, 4 pp., April 1968.

The President's Science Advisory Committee reported in 1965 that air pollution damage to plants had been observed in 27 states, the District of Columbia, Canada, and Mexico. Total damage each year to crops in the United States is estimated at $500 million. Weather fleck damage to tobacco, which is caused by ozone, has caused substantial crop loss in all producing states. Sulfur dioxide, fluorine, ethylene, and photochemical smog are known to be harmful to plants. A research program to solve unanswered questions, and a program to enforce the cleaning up of pollution sources is urgently needed.##

14968

Daines, Robert H., Eileen Brennan, and Ida Leone

AIR POLLUTANTS AND PLANT RESPONSE. J. Forestry, 65(6):381-384, June 1967. 15 refs.

The effects of a number of acid gases and photochemically-produced pollutants on plants are described. A great variation in susceptibility to damage by such gases as fluorides and SO2 exist both among plant species and within a single species. Injury from these gases occurs primarily to younger leaves, with little or no damage shown by old leaves. Symptoms usually consist of marginal and tip necrosis with accompanying discoloration of the affected areas. Limited studies with chlorine suggest that it is less phytotoxic than hydrofluoric acid, requiring about 0.1 ppm to injure the more sensitive plants. Among the photochemically-produced pollutants, ozone has been known for many years to be toxic to a wide variety of plant species; ozone toxicity symptoms appear as flecks, stipple, streaks, spots, and tip necrosis. Injury appears on mature leaves, with the oldest leaves of young plants and middle-aged leaves of old plants being most susceptible. Peroxyacetylnitrate (PAN) and its analogues are highly phytotoxic, producing symptoms called 'silver leaf' and 'leaf banding' in California, the northeastern U. S., and other urbanized areas. Like ozone, these compounds are believed to cause severe annual economic losses in crop damage. Investigations of damage caused by other photochemical pollutants, namely ozonated hydrocarbons, bisulfite reaction products, and nitrogen dioxide, are briefly summarized, and the major sources of all the pollutants discussed are noted.

00115

R. L. Ajax, C. J. Conlee, and J. B. Upham

THE EFFECTS OF AIR POLLUTION ON DYED FABRICS. J. Air Pollution Control Assoc. 17,(4) 220-4, April 1967.

This report details results from the first 6 months of a 2-year study begun in February 1965 by The American Association of Textile Chemists and Colorists and the Public Health Service to evaluate the effects of air pollution upon dyed fabrics. Groups of 69 dye-fabric combinations representing widely used dyes have been exposed in light-free cabinets to ambient environments at urban and rural sites at Chicago, Washington, D.C., Tacoma, and Los Angeles, and at urban sites at Cincinnati, Phoenix, and Sarasota. Results from consecutive 3-month seasonal exposures and controlled-environment exposures utilizing irradiated and nonirradiated automobile exhaust for short duration show an extreme fading on one quarter of the dyed-fabrics, a higher fading at urban compared with rural sites on susceptible fabrics, and a marked effect upon the dyed fabrics by the photochemical by-products of automobile exhaust. (Author abstract)##

00695

R. V. Chiarenzelli and E. L. Joba

THE EFFECTS OF AIR POLLUTION ON ELECTRICAL CONTACT MATERIALS: A FIELD STUDY. J. Air Pollution Control Assoc. 16, (3) 123-7, Mar. 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965.)

A long-term field and laboratory program designed to determine and understand the effects of air pollutants on electric contact materials and their performance has reached the one-year mark. An extensive variety of precious and nonnoble metals and alloys has been exposed for periods ranging up to one year (August 1963 to August 1964) at 6 field environments. These environments were selected to provide a wide range of air pollutants in typical data processing or process control situations and comprise such diverse locations as an air-conditioned data processing room in New York City, an east coast oil refinery, an east coast chemical plant, a business location in Los Angeles, a paper mill in the south, and a heavy manufacturing plant in Buffalo. The program undertakes to correlate material degraduation as a function of time and environment. Humidity, temperature, and sulfur dioxide are measured on a continual basis, and point-in-time measurements of dust, HF, aldehydes, oxidants (ozone), NO2,

SO_2, H_2S, NH_3, and Cl are made on a quarterly basis. Materials are returned periodically and evaluated in the laboratory by contact resistance probing, electrolytic reduction, and standard metallographic techniques. The results of the program to date are presented, and preliminary correlations are drawn. The program is evaluated from the vantage point of the one year mark. Deficiencies and aspects of special utility are described. (Author abstract)##

01983

A. P. Altshuller, A. F. Wartburg, I. R. Cohen, and S. F. Sleva

STORAGE OF VAPORS AND GASES IN PLASTIC BAGS. Intern. J. Air Water Pollution 6, 75-81, 1962.

Plastic bags of "Scotchpak" are satisfactory over 24 hr periods for storing synthetic and atmospheric samples of aliphatic hydrocarbons and acrolein, but not for storing formaldehyde, ozone, nitrogen dioxide. Plastic bags of "Mylar" are satisfactory for storing synthetic mixtures containing formaldehyde over 24 hr periods and ozone, nitrogen dioxide, and sulfur dioxide for at least several hour periods. Formaldehyde in atmospheric gases can be stored for several hours. New bags of these materials should be conditioned for several hours using the gases of vapors of interest at the same or somewhat higher concentrations than are to be used in the investigations to follow. Bags which are so treated should serve as convenient storage containers for the gases studied, as well as many other chemical species over periods of many hours. However, very appreciable losses of many of these gases may occur when present as part of combustion gas mixtures collected in such plastic containers. (Author abstract)##

02060

Z. Travnicek.

EFFECTS OF AIR POLLUTION ON TEXTILES, ESPECIALLY SYNTHETIC FIBRES. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper VII/4). pp. 224-6.

The Czechoslovak Knitting Industries Research Institute's laboratory for atmospheric defectochemistry of fibres has investigated the deterioration of fibres due to atmospheric pollutants. By analyzing witnesses' reports, by inspecting textiles damaged in the open and, above all, by operating special simulation apparatuses it has been established that apart from hot particles textiles, especially those of some synthetic fibres, can be destroyed by sulphur dioxide, especially if the latter is absorbed to solid carrier aerosols, by nitrogen oxides, by some substances contained in automotive exhaust gases, by various acid fumes, by strong oxidizers and by solvent vapours. Exhaust gases cross-link the fibre-forming polymers while, at the same time, degrading them. Light stabilizers in fibres also act as preventers of damage by exhaust fumes, to a certain degree. Dyestuffs can be efficient in a similar way. Automotive exhaust gases are sometimes more destructive if present in great dilutions in air irradiated by sunlight. In this case, a formation of strong oxidizers from residual olefins and nitrogen oxides is suspected. (Author abstract)##

02270

C. H. Giles

THE FADING OF COLOURING MATTERS. J. Appl. Chem. (London) 15, 541-50, Dec. 1965. (Presented at the Second International Conference, International Inst. for Conservation (I.C.C.), Delft, Netherlands, July 7, 1964.)

This paper describes most of the influences which affect the permanence of colouring matters, yet in making practical suggestions for prolonging the life of museum specimens little can be added to the recommendations made by Russell & Abney 77 years ago. If the specimens are coloured with organic colouring matters, store them in a dry, clean, acid-free and oxygen-free atmosphere, and allow them to be illuminated in the weakest acceptable light, without ultraviolet radiation, for the shortest practicable time. (Author conclusion)##

02380

J. B. Upham.

MATERIALS DETERIORATION AND AIR POLLUTION (PRESENT STATUS OF THE PUBLIC HEALTH SERVICE'S PROGRAM). J. Air Pollution Control Assoc. 15, (6) 265, June 1965. (Presented at the 57th Annual Meeting, Air Pollution Control Association, Houston, Tex., June 21-25, 1964, Paper No. 64-31.)

Four separate studies dealing primarily with atmospheric corrosion are presently in progress and constitute the first phase of an over-all program to assess materials deterioration due to air pollution. The objectives of these studies and the methodology used are described, and limited preliminary data are reported. From the findings of these and subsequent studies we hope to determine the role of air pollution in the deterioration of many materials. (Author summary)##

02941

V. S. Salvin

EFFECT OF AIR POLLUTANTS ON DYED FABRICS. J. Air Pollution Control Assoc. 13, (9) 416-22, Sept. 1963. (Presented at the 56th Annual Meeting, Air Pollution Control Association, Detroit, Mich., June 9-13, 1963, Paper No. 63-84.)

The fading of dyes through chemical reaction with atmospheric contaminants has been responsible for complaints from air pollution areas. Oxides of nitrogen and ozone are contaminants which have beeen established as reactants. Sulfur dioxide is the source of absorbed acid which can accelerate the reactions. The fading of dyes by ozone takes place in air pollution and in rural areas. The contribution of air pollution to increased ozone and oxidant concentrations is demonstrated in service exposure fadings. Sunlight fastness results are shown to require consideration of simultaneous change due to atmospheric contaminants. Exposure to irradiated auto exhaust gases under controlled conditions gives fading results which are equivalent to service exposures in Los Angeles.##

03294

T. W. Steading.

A STUDY OF THE EFFECTS OF AIR POLLUTANTS ON COMPUTERS. J. Air Pollution Control Assoc. 15, (3) 99-101, Mar. 1965. (Presented at the Sixth Conference on Methods in Air Pollution Studies, California Dept. of Public Health, Berkeley, Calif., Jan. 6-7, 1964.

The project at the IBM San Jose Product Testing Laboratory is directed at determining the mechanisms of failure caused by the air pollutants and to evaluate the design changes (either material, configuration, or isolation) to eliminate the problem. The first step taken has been the characterization of the indoor office environment where computers are used or could be used. Indoor loadings of up to 1,000 micrograms per cubic meter are not unusual and many offices would have periods of significant duration at 500 micrograms per cubic meter and higher. Indoor dust levels showed no direct relationship to outdoor dust levels. Air conditioned areas, which many thought gave a cleaner indoor environment, showed the same level as non-air conditioned offices except where special air filtering equipment was installed. Traffic through the office area is probably one of the prime factors. In the two-week studies in two locations, we found the daily patterns were found to be repeatable and higher in maximum to minimum levels. Variations of 10:1 occur and are considered normal. The dust test chamber, the test dusts, the particle counter, the gaseous environment simulation chamber, and the instrumentation are described.##

04027

Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control. 1967. 66 pp.

EFFECT NETWORK - TABULATION OF DATA 1966.

In order to enable cooperating agencies to make use of the data in their local programs without any undue delay, this annual summary from the Interstate Air Pollution Effects Surveillance Network for the period January 5 to December 28, 1966 is presented in an informal manner. Raw data on zinc deterioration, steel corrosion, cotton fabric deterioration, silver tarnishing, lead peroxide candles, dustfall, nylon deterioration, sticky paper particles, and rubber cracking are tabulated. No interpretation of the data was made.##

08612

Bacskai, Gyula

AIR POLLUTION BY THE CHEMICAL INDUSTRY AND ITS EFFECT ON THE CORROSION OF CONSTRUCTION MATERIAL. ((Vegyipari atmoszfera szennyezodese es hatasa a szerkezeti anyagok korroziojara.)) Text in Hungarian. Magy. Kem. Lapja (Budapest), 22(10):534-539, 1967. 7 refs.

Concentrations of air pollutants,such as chlorine,phenol, ammonia, SO2, and NO2, in different Hungarian chemical plants are given and the effect of these pollutants on corrosion of construction materials, particularly iron and zinc is discussed. Corrosion is increased by the gaseous and solid contaminants of the atmosphere. Deeper insight into atmospheric corrosion mechanisms is required to provide efficient protection.

14926

Kobayashi, Y., T. Matsuzawa, G. Uwamino, M. Saigo, T. Kuwajima, and S. Nishimura

STUDIES ON THE BEHAVIOR OF AIR POLLUTANTS IN OUTDOOR AND INDOOR. (Gaiki oyobi shitsunai ni okeru taikiosen bushittsu no kodo ni kansuru chosakenkyu). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 7(2):18-24, June 1969. 8 refs.

It is assumed that the major reason for telephone dialing trouble lies in air pollution. The purpose of this study was to check the influence of air pollutants on the stationary machines in a telephone exchange office. Fifteen offices were examined for the dust density outside and inside, the amount of dust accumulated on the floor and sulfur oxide, nitrogen oxide, and acidic gas concentrations. The outside dust density was as follows: Osaka area, 0.8-5 mg/cu m; Tokyo area, 0.1-1.2 mg/cu m, Yokohama area, 0.4-0.6 mg/cu m; and the others were 0.03-0.4 mg/cu m. The dust density indoors had a maximum of 1.2 mg/cu m in Osaka and a minimum of 0.02 mg/cu m in Aizuwakamatsu. The ratio of the dust density of the indoor air to office air and to exchange room air was 0.3:1:0.1. Dust density varied directly with height from the ground; maximum concentration was recorded from the first to the third floor. Sulfurous acid erosion did not show a noticeable relation to dialing trouble, so it was thought that nitrogen oxides were responsible.

15679

Fujikawa, Fukujiro, Kunio Hirai, Teruhisa Hirayama, Mitsuo Fujii, Jitsuzo Makita, Fusako Sugiyama, Kazumi Ichinomiya, Jiro Takimoto, Hiroshi Yamada, Hiroshi Kawaguchi, Masaki Sawatari, Yukichi Matsuyama, Junichi Ueda, Teiji, Hatsutori, Masaaki Kadoma, Katsuji Okasak, Hiroshi Nakamura, Yasuo Mantani, and Nobuo Takeda

THE INFLUENCES OF AIR POLLUTION ON SOME CULTURAL ASSETS. I. ON THE AIR-POLLUTIONAL MEASUREMENT BY THE FILTER PAPER METHOD AND

THE INFLUENCE OF AIR POLLUTION ON METALLIC LUSTER. (Taikiosen niyoru bunkazai nitaisuru eikyo (dai 1 po) anukariroshiho niyoru taikosennodo no sokutei to soreno kinzokukotaku nioyobosu eikyo nitsuite.) Text in Japanese. Eisei Kagaku (J. Hyg. Chem.), 15(6):377-387, Dec. 31, 1969.

Concentrations of sulfur oxides and nitrogen dioxide in the atmosphere were measured by an alkaline filter-paper method in the summer and winter at 100 locations in Kyoto. The grounds of shrines and temples where important cultural properties were placed were included on the study. A significantly higher concentration of sulfur oxides and nitrogen dioxide was observed in the winter than in the summer. The effect of the pollutants on the metallic luster of the cultural properties was also investigated. It was found that the rate of decrease in metallic luster was about 10% lower in winter than in summer. Although it was supposed that weather conditions were responsible for the decrease in metallic luster, a correlation was found between the concentration of sulfur oxides and rate of decrease in luster. No correlation was found for nitrogen dioxide concentration and luster. (Author abstract modified)

EFFECTS—ECONOMIC

05634

R. E. Kohn

LEAF BURNING (AN ECONOMIC CASE STUDY). Sci. Citizen 9, (4) 71-5, Apr. 1967.

The application of benefit/cost analysis to leaf burning in a St. Louis, 7issouri, suburb (Clayton) is presented. It consists of defining five items: the benefits of avoiding pollution; the benefits of avoiding other leaf-burning hazards; the possible
sci citizen
the effects that leaf-mulching will have on this control cost. The benefits are computed separately and then put together as are the costs. The result figured by dividing the aggregate benefits by the aggregate costs indicate whether it is economically feasible to replace leaf-burning with a municipal collection program. The study confirms the usefulness of benefit/cost analysis for air pollution control. In addition, the study indicates that municipal leaf collection can result in economic gains for both home owners and municipalities, and that leaves, like many other "waste" products, can be converted into a useful resource.##

AIR QUALITY MEASUREMENTS

00005

S. Hochheiser, S. W. Horstman, and G. M. Tate, Jr.

A PILOT STUDY OF AIR POLLUTION IN BIRMINGHAM, ALABAMA (WIDE-ANGLE VIEW OF BIRMINGHAM FROM VULCANS STATUE). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. May 1962, 68p.

Air samples were collected for measurement of dustfall, suspended particulates, smoke shade, sulfur dioxide, nitrogen oxides, total oxidants, carbon monoxide and hydrogen sulfide. Air pollution data obtained during the summer phase of the study can be considered as representative. Mean values of gaseous pollutants were: SO2, 0.01 ppm; nitrogen oxides, 0.04 ppm; oxidants, 0.03 ppm; CO, 1.8 ppm. Maximum levels measured were: SO2, 0.18 ppm; nitrogen oxides, 0.14 ppm, oxidants, 0.14 ppm; CO, 12.5 ppm. Mean values for particulate pollutants, measured during the fall study, were: dustfall, 76 tons/sq.mi./mo.; smoke concentration, 1.5 cohs/1000 linear ft.; suspended particulates, 113 micrograms/cu.m. Maximum levels were: dustfall, 121 tons/sq.mi./mo.; smoke concentration, 6.2 cohs/1000 linear ft.; suspended particulates, 279 micrograms/cu.m. Mean values measured during the summer study were: dustfall, 49.3; smoke concentration, 0.6; suspended particulates 106. Maximum levels were: dustfall 95.6; smoke concentration, 3.0; suspended particulates, 206. Substantially higher levels of particulate and gaseous pollutants were recorded in the fall, indicating that emissions resulting from the combustion of fuels for industrial, commercial and domestic space heating contribute significantly to over-all air pollution during the heating season.##

00017

AIR QUALITY DATA. (ANNUAL REPORT FOR 1962) (NATIONAL AIR SAMPLING NETWORK). Public Health Service, Cincinnati, Ohio Div. of Air Pollution, 52p.

This report contains summaries of air quality data for particulate and gaseous pollutants obtained from samples collected by stations of the National Air Sampling Network during 1962. Included also are data obtained by the analysis of selected particulate samples collected during the period 1958-1961. For the first time data from State Air Sampling Network report. This is a logical step, as procedures are standard and data are comparable. The following state networks provided data for inclusion in this 1962 report: Maryland, Massachusetts, Montana, Texas, and Washington. (Author)##

00041

W.F. Ashe

HEALTH EFFECTS OF ACUTE AIR POLLUTION EPISODES. Ohio State Univ., Columbus, School of Medicine. (Presented at the National Conference on Air Pollution, Washington, D.C., Nov. 1958.) Nov. 19, 1958, 9p.

Air pollution can and has produced serious illness and even death. However, since all industrial cities, the world over, produce air pollution in tons per day all the time, and since there are only a handful of authenticated episodes of acute illness due to it, one must conclude that acute illness and/or death due to air pollution is unusual. The situation which produces dangerous air pollution is a particular kind of weather which is predictable. The prediction and prevention of air pollution episodes must be approached with utmost caution.##

00110

R. I. Larsen

DETERMINING SOURCE REDUCTION NEEDED TO MEET AIR QUALITY STANDARDS. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper III/8.) pp. 60-4.

Air pollutant concentrations can be expressed as a function of location, averaging time, and frequency that a certain concentration is exceeded. Concentration data can be used with air quality standards to calculate the overall source reduction needed to meet a standard. The calculations can be refined to consider the effects of future growth, rural background concentrations, secondary pollutants arising from photochemical and other atmospheric interactions, and the contribution from each source or source type in a city. (Author)##

00152

AUTOMOTIVE AIR POLLUTION IV. (A REPORT OF THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE TO THE U.S. CONGRESS PURSUANT TO PUBLIC LAW 88-206 - THE CLEAN AIR ACT.) 89th Congress (2nd Session.) (Document No. 101.) July 28, 1966. 15 pp.

Emission standards in accordance with section 202 of the amended Clean Air Act have been established to limit the crankcase emissions and the exhaust hydrocarbons and carbon monoxide emissions of all passenger cars and light commercial vehicles with engines larger than 50 cubic inches total displacement, effective with the 1968 models. Procedures are in the final stage of development to enable manufacturers who so request to make application for certification that their vehicles or engines do conform with the Federal regulations as provided for in section 206 of the Clean Air Act. A Federal motor vehicle compliance laboratory is being established in Metropolitan Detroit for confirmation and surveillance testing and to provide assistance and guidance to the vehicle manufacturers. Emission tests of 1966-model cars equipped with California-type exhaust emission controls are being conducted to determine the effectiveness of the systems, and, to some extent, their maintenance history is being reviewed. It is anticipated that when the 1967 models are introduced in California the program will be expanded to include a number of these cars as well. Extensive reports of industry progress in dealing with the automotive air pollution problem are appearing in technical presentations before the Society of Automotive Engineers; 18 such presentations were made in January 1966, and 7 more are scheduled for June 1966. The Public Health Service is placing increased emphasis upon studies which will lead to improved test procedures and which will form the basis for possible revisions in emission standards for future application. (Author)##

00241

R.W. Hurn D.F. Seizinger

AIR POLLUTION INVENTORY - ENTER THE DIESEL. Proc. Am. Petrol. Inst., 45(111):127-132, May 1965. (Presented at the 30th Midyear Meeting, American Petroleum Inst. Div. of Refining, Montreal, Canada, May 10, 1965.)

Exhaust gases from truck-type diesel engines tested on a dynamometer stand were shown to involve hydrocarbons, oxides of nitrogen, and formaldehyde in significant quantities. Without reference to similar modes of operation, each class of pollutant was found to be generated in the diesel combustion in concentrations comparable to concentrations found in automotive (gasoline-powered) equipment. Although some trends in the data were observed, the experimental program was not extensive enough to justify conclusions regarding effects of fuels, engine design, or mode of engine operation. In comparing present findings with previously published information, the authors have noted interpretations of data that do not readily reflect the significant magnitudes of diesel emissions. Both the real contribution of diesels to air pollutant loading and the participation of these pollutants in the photochemical system should be weighed more carefully. (Authors' abstract)##

00251

L. R. Reckner, W. E. Scott and W. F. Biller

THE COMPOSITION AND ODOR OF DIESEL EXHAUST. Proc. Am. Petrol. Inst. 45(111):133-147, May 1965. (Presented at the 30th Midyear Meeting, American Petroleum Inst. Division of Refining, Montreal, Canada, May 10, 1965.)

Sampling and analysis techniques are described for determining light hydrocarbons, oxides of nitrogen, formaldehyde, acrolein, total aldehydes, total particulate, and polycyclic aromatic hydrocarbons in diesel exhaust. Using the techniques described, results are reported on the composition of exhaust from two diesel engines, a two- and a four-cycle, under a variety of operating conditions. Smoke ratings using different techniques are also reported and compared to total particulate results. No correlation was found between smokemeter ratings and particulate loadings at other than black smoke conditions. Human panel observations of exhaust odor are being made as part of a continuing program, but no panel data are reported. (Authors' abstract)**

00321

R. I. Larsen, C. E. Zimmer, D. A. Lynn, K. G. Blemel

ANALYZING AIR POLLUTANT CONCENTRATION AND DOSAGE DATA. J. Air Pollution Control Assoc. 17, (2) 85-93, Feb. 1967. (Presented at the 59th Annual Meeting of the Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-93.)

Continuous air pollutant concentration data have been analyzed for carbon monoxide, hydrocarbons, nitric oxide, nitrogen dioxide, nitrogen oxides, oxidant, and sulfur San Francisco, and Washington for years 1962 through 1964. Concentrations are approximately lognormally distributed for all pollutants in all cities for all averaging times. Maximum concentration is inversely proportional to averaging time to an exponent. Air pollutant dosage (concentration times time) above various threshold concentrations has been computed for all of the pollutants in all of the cities for year 1964. Equations have been developed from these analyses to predict the frequency of occurrence of air pollutant dosages of various intensities as a function of the geometric mean and standard geometric deviation. An example is shown for predicting the number of occurrences of sulfur dioxide dosages that might cause acute plant damage. (Author)**

00346

M. E. Miller and G. C. Holzworth

AN ATMOSPHERIC DIFFUSION MODEL FOR METROPOLITAN AREAS. Preprint. J. Air Pollution Control Assoc. 17, (1) 46-50, Jan. 1967. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966, Paper No. 66-30.)

An urban diffusion model, which does not require the use of an electronic computer, is presented. The main simplifying assumptions are that: (1) continuous pollutant sources are uniformly distributed over the urban area, which may be treated as a series of uniform crosswind line sources, and (2) vertical diffusion occurs until the effluent from each line source reaches the top of the mixing layer, after which the effluent is uniformly distributed through the mixing layer. After the appropriate vertical diffusion coefficient is specified, the calculated concentration is a function of the source strength, the linear dimension of the metropolis along the wind direction, the mixing depth, and the wind speed. The calculated concentration is interpreted either as a representative maximum concentration or, through integration, as the average concentration over the metropolitan area. When a representative pollutant concentration is known, the model may be used to determine the apparent "uniform" source strength. The model is being considered as a basis for a quantitative national air pollution forecasting service. (Author)##

00526

Middleton, J. T.

CONTROL OF ENVIRONMENT - ECONOMIC AND TECHNOLOGICAL PROSPECTS. Preprint. In: Environ. Improvement: Air, Water, Soil, pp. 53-71, Oct. 1966. (Presented at the Dept. of Agriculture on or about ~~May~~ 24, 1966)

Man's exploitation of land, water, and air has caused serious pollution of his environment, not only affecting man but other living organisms, quality of the land, water, and air resources. Not only must large sums of money be spent to restore the quality of man's environment, but it must be done quickly. The quality of air is determined by the uses made of air and by the pollutants injected into it by man. While some air contamination results from pesticides and chemical manufacturing the greatest degradation results from the use of air to support combustion. Principal pollutants from combustion for the development of energy and the propulsion of motor vehicles, and the manufacture of goods are liquid and solid particles, oxides of S and N, organic vapors, CO2 and CO. The pollutant released in largest quantities throughout the nation is SO2, amounting to 23,300,000 tons a year. The quality of air within a given air shed depends upon the nature of pollutants, the quality of the air supply and the geographical and meteorological factors affecting the movement and dispersal of contaminants. One result of multiple pollution sources is the combination of N oxides and organic vapors in the presence of sunlight, resulting in photochemical air pollution i.e. ozone, peroxyacetyl nitrate (PAN), aldehydes, and organic acids. The resulting pollution effects are metal corrosion, building and fabric deterioration, cracking of rubber, visibility reduction, forest and agriculture damages, livestock injury health problems, and the spoiling of air environment. The recognized importance of these effects, the recognition of air pollution as a social problem, and the enactment of legislation to control air quality has occurred at both state and national levels.##

00528

P. E. Hatchard

PORTLAND'S NEW AIR QUALITY CONTROL PROGRAM. Preprint. (Presented at the Second Annual Meeting, Pacific Northwest International Section, Air Pollution Control Association, Portland, Oreg., Nov. 5-6, 1964.)

After ten years of developmental steps, the city of Portland is moving forward rapidly to implement the new Air Quality Control Code. The new registration program will produce a large quantity of detaild information regarding community sources. The ten dollar fee is helping to finance the initial program costs. The relatively large numbers of complaints received are being investigated and where violations are found, corrective action is forthcoming. Many long-standing smoke and other particulate source problems are being controlled. In the future, increased emphasis will be placed upon the control of local geographical areas within the City. This approach will be balanced with a planned community-wide control of similar industrial, commercial and public sources. Additional public informational activities are needed to develop support for the necessary changes to improve Portland's air quality conditions. (Author's summary)##

00534

C. B. Robinson, F. L. Meadows, and J. J. Henderson

AIR POLLUTION PATTERNS IN THE GREATER BIRMINGHAM AREA. Preprint. 1965.

In 1962, the Alabama Respiratory Disease and Air Pollution Study was initiated to determine the prevalence of various pulmonary disorders and to relate these findings with air quality data. This paper describes part of the aerometric effort begun in December 1963 in the Greater Birmingham Area. Samples for analysis of suspended particulate, dustfall, sulfation, and 24-hou gases (nitrogen dioxide, sulfur dioxide, and aldehydes) were collected routinely from 21 stations located primarily in residential areas. The sampling network, analytical methods, and statistical procedures used are discussed. Air quality results are presented with emphasis on spatial and temporal variations. (Authors' abstract)##

00739

C.E. Zimmer R.I. Larsen

CALCULATING AIR QUALITY AND ITS CONTROL. J. Air Pollution Control Assoc., 15(12):565-572, Dec. 1965. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965.)

Air quality is shown as a function of averaging times of five minutes to one year for carbon monoxide, hydrocarbons, nitric oxide, nitrogen dioxide, nitrogen oxides, oxidant, and sulfur dioxide in Chicago, Cincinnati, Los Angeles, New Orleans, Philadelphia, San Francisco, and Washington, D. C. Concentrations are approximately lognormally distributed for all pollutants in all cities for all averaging times. Maximum concentration is inversely proportional to averaging time to an exponent. The exponent is a function of the standard geometric deviation. General air quality and control parameters are derived and shown for one example, nitrogen oxides in Washington, D. C. These values are compared to one air quality standard. (Authors' abstract)##

00802

I.H. Williams

AN ATMOSPHERIC SURVEY OF CHILLIWACK, BRITISH COLUMBIA. Preprint. 1963.

A one-year study of the air pollution level of the City of Chilliwack has been completed. Methods employed and data collected for dustfall, sulfation rates, soiling index, hydrogen sulfide, oxidants and total hydrocarbons are presented. Difficulties experienced in the determination of very low oxidant levels are discussed. The results obtained indicate that the City is particularly free of air pollutants and thus will serve as a suitable base for comparative studies on the relationship between air pollution and other factors in the prevalence of certain chronic respiratory diseases. (Author abstract)##

00847

J.D. Williams N.G. Edmisten

AN AIR RESOURCE MANAGEMENT PLAN FOR THE NASHVILLE METROPOLITAN AREA. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. Sept. 1965. 160 pp.
GPO: 822-811-8, HEW: 999 AP - 18

This report is based on the numerous technical and scientific papers resulting from a major study of air pollution and effects made in Nashville, Tennessee, by the Public Health Service, Vanderbilt University, and state and local agencies during 1958-59. These papers have been supplemented by field investigations to complete the background information needed for preparation of an air resource management program plan. The report summarizes a number of the technical and scientific papers and uses all of them to develop new concepts as well as unify new and old approaches to air pollution control in preparation of the air resource management program plan. Air quality goals and the means to reach those goals are suggested. Supporting data are provided and methodology adapted for relating air quality goals to control of emissions. Methods for predicting air pollutant levels by use of mathematical models are presented. Public opinion survey results and their implications for the air resource management program are given. The report has specific use for development of an air resource management program in Nashville and general use for program development and reference in many other places. (Author abstract)##

01010

A REPORT TO THE LEGISLATURE ON AIR POLLUTION IN COLORADO. Colorado State Dept. of Public Health, Denver. Feb. 5, 1964. 66 pp.

A series of studies by the State Department of Public Health, local health departments and other interested agencies and groups led to the present Colorado Air Pollution Law calling for the State Department of Public Health to study the air pollution problem and to recommend ambient air standards and control measures. Colorado is experiencing a rapid growth of population, urbanization and sources of air pollution, and meteorological and topographical features over much of the State are conducive to the development of serious air pollution conditions. With the assistance of the Colorado Air Pollution Advisory Committee, the State Dept. of Public Health has recommended standards for ambient air quality in the State. Air quality monitoring programs in six of Colorado's largest cities were conducted and much information about the extent and nature of the air pollution problem was obtained. Three monitored areas (Denver Metropolitan Area, Boulder and Pueblo) definitely do not meet the ambient air quality standards established and one (Grand Junction) might not meet the standards. The geographical air pollution basins of the areas that do not meet the standards have been outlined, with the exception of Boulder. The geographical boundaries for Boulder will be determined at an early date. Measures for the abatement of air pollution within the State have been recommended and are listed. (Author summary)##

01066

R.I. Larsen

UNITED STATES AIR QUALITY. Arch. Environ. Health Vol 8:325-333, Feb. 1964. (Presented at the Lead Symposium held at Kettering Lab. in the Dept. of Preventive Medicine and Industrial Health, Coll. of Medicine, Cincinnati Univ., Feb. 25-27, 1963.)

Particulate pollutant parameters are given for 20 particles measured in United States urban air. Gaseous pollutant parameters are given for sulfur dioxide concentrations measured in Chicago, Cincinnati, Los Angeles, Nashville, New Orleans, Philadelphia, San Francisco, and Washington. Data for carbon monoxide and nitrogen oxide concentrations in some of these cities are also presented. Pollutant concentration is related to city size and distance from city center. Sulfate particulate concentration is related to sulfur dioxide concentration. Pollutant concentrations are discussed in terms of relative effects and absolute units. Means are presently available or are being developed to control the emission of all these pollutants except the nitrogen oxides, which come from all combustion sources. There is no known easy method for controlling nitrogen combustion sources. There is no known easy method for controlling nitrogen oxides. In the decades ahead, the ultimate solution to pollution from the nitrogen oxides as well as the ohter pollutrats may be the use of much less high-temperature combustion, in homes, vehicles, and industry. Fuel cells and atomic fission or fusion might then power the nation electrically. (Author Summary)##

01270

M. Katz

QUALITY STANDARDS FOR AIR AND WATER. Occupational Health Rev. (Ottawa) 17(1):3-8, 1965. (Presented at the Occupational Health and Safety Conference, Canadian Congress of Labour, North Bay, Ontario, Nov. 16, 1964).

Author reiterates air quality standards and threshold limit values for gases and vapors (ppm) in the USSR and USA: ambient air quality standards and workroom air threshold limit values for some gases (carbon monoxide, chlorine, hydrogen chloride, ethylene, ozone, oxides of nitrogen and sulfur dioxide); air quality standards and threshold limit values for solids or liquids; and comparative ambient air quality standards for particulate matter. Data are given for California, Oregon, USSR, Czechoslovakia and West Germany.##

01427

J. P. Lodge, Jr. and J. B. Pate

ATMOSPHERIC GASES AND PARTICULES IN PANAMA. Science, Vol. 153:408-410, July 22, 1966.

The concentrations of trace gases in tropical air from samples taken on the Isthmus of Panama are compared with those reported by others. The role of a tropical land mass as a sink or source of atmospheric components is discussed. (Author abstract)##

01594

AIR POLLUTION MEASUREMENTS OF THE NATIONAL AIR SAMPLING NETWORK - ANALYSES OF SUPENDED PARTICULATES 1963. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. 1965. 90 pp.

In 1963 the National Air Sampling Neteork encompassed some 200 stations. This report presents the results of analyses performed on samples collected at these stations in 1963 and also results of analyses performed in 1963 on some samples collected in previous years. These results are tabulated in the Summary Table. Most pollutant levels are reported as geometric means (designated hereafter as 'neans') for reasons discussed in Appendix A. Where it is not feasible to calculate the geometric parameters, arithmetic means are used. (Author summary modified)##

01770

F. A. Bell, Jr.

SHORT-TERM AIR POLLUTION STUDIES. Civil Eng. N.Y. 33, 48-51, Feb. 1963.

Air pollution studies designed to measure the concentration of oxidants, carbon monoxide, sulfur dioxide, nitric oxide and nitrogen dioxide in the cities of Washington, D.C., Lynchburg, Virginia, Tucson, Arizona, Phoenix, Arizona and Fresno, California are discussed. The area surveys are conducted over a short term time period and author elucidates the advantages and disadvantages of this approach.##

01790

A.N. Heller D.F. Walters

IMPACT OF CHANGING PATTERNS OF ENERGY USE ON COMMUNITY AIR QUALITY. J. Air Pollution Control Assoc. 15, (9) 423-8, Sept. 1965

The air quality of an urban area depends to a great extent upon the quantity and type of fuel consumed. Thus, a marked change in energy demand from 1960 to 2000 A.D. will affect the air quality of all of our urban centers. Interwoven with this potential effect is the anticipated influence of the change in type and quality of fuels, e.q., nuclear fuels, high sulfur coals, and a major modification in energy drived motive power, i.e., fuel cells, and the subsequent depletion of natural gas as an energy raw material. The current trend is to greater urban population densities, and it is estimated that by the year 2000 A.D., 85 percent of America's population will live on only 10 percent of thre land mass. To assess the potential impact of the energy demands for the next half century on air quality, particularly of America's urban centers, a review of current practices of combustion of coal, petroleum, and natural gas, and the potential effect on community air quality will be developed. To meet the impact of the interrelated changing patterns of population growth, urban developments, energy requirements and available sources, research needs on both a short and long term basis will be explored. (Author abstract)##

01829

W. J. Basbagill

AIR CONTAMINANT MEASUREMENTS AT ROOSEVELT FIELD, NASSAU COUNTY, NEW YORK(JANUARY - FEBRUARY 1964). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. July 1965. 53 pp.

Based on the meteorological conditions observed, contaminant levels measured during the study may be considered typical for this site during the winter months. Since there were no cases of severe atmospheric stagnation during the study, measurement of maximum contamination levels was not possible. Conclusions based on the data obtained in this study are: (1) Particulate matter contamination as indicated by soiling index measurements was "heavy" to "extremely heavy" about 9% of the time; this indicates that air contamination from emission of small-sized particulates should be reduced. (2) SO2 concentrations were excessive. Action to control emission of this contaminant should be considered. (3) CO and oxides of nitrogen concentrations were somewhat greater than desirable. (4) Photochemical smog was not present, nor was it expected at this time of year. It is recommended that the existing air monitoring program be expanded. The number of sampling sites should be increased and measurement of other contaminants should be initiated. These data will indicate seasonal variations in pollution, measure the effectiveness of air resource management programs, document long-term trends of air quality as related to changes in the nature of contaminant sources, and relate air contamination to its effects. Because air contamination does not recognize political boundaries, this air monitoring program and other aspects of the air resource management program should extend throughout the entire county. Data from surrounding jurisdictions should be considered also.##

01830

R. M. Brice and J. H. Ludwig

THE DISTRIBUTION OF VEHICULAR AIR POLLUTION IN THE UNITED STATES.

Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper 65-21.)

The contribution of automotive vehicular emissions to air pollution and the magnitude of the effects of these emissions have been well documented in Los Angeles County and to a lesser extent throughout the State of California. Data are presented which show the presence of photochemical "smog" and prevalence of "smog" in eastern communities is not as high as in Los Angeles; however, evidence from most large cities where atmospheric pollutants have been measured shows some photochemical activity with production of oxidants throughout the year and severe "smog" when adverse meteorological conditions occur. Plant damage of the types associated with photochemical pollutants has been observed in many areas throughout the country and further indicates the presence of adverse levels of motor-vehicle-derived pollutants. Source surveys in a number of cities in the United States show that motor vehicles are responsible for very appreciable amounts of the total emissions of hydrocarbons, nitrogen oxides, and carbon monoxide. The facts presented clearly point to potential problems under current conditions and problems of increasing severity as population densities and use of motor vehicles increase. (Author abstract)##

01864

SIXTH ANNUAL REPORT OF THE AUCKLAND AIR POLLUTION RESEARCH COMMITTEE. (Annual Rept. 1965). Auckland Air Pollution Research Committee, New Zealand Mar. 31, 1965. 42 pp.

This is the Sixth Annual Report of the Auckland Air Pollution Research Committee presented to the Local Authorities of Metropolitan Auckland, and it summarises the first 3 years of the planned 5 year survey. The main work of the Committee has been in three fields. The first field has been a continued study of the meteorological and topographical conditions that affect air pollution in the metropolitan area. Inversion conditions which contribute to concentration of pollutants in certain areas, exist quite frequently during the night, particularly in autumn and winter. However, present records show that these conditions do not persist during the day, so that cumulative concentrations are avoided. The second field has been the continuation of the five-year metropolitan air pollution survey, now in its third year. The records continue to indicate that no major problem yet exists. The third field concerns atmospheric pollution by motor vehicles. Records indicate that the position is satisfactory, even though the ratio of vehicles to population in Auckland is similar to that in Los Angeles where a serious pollution problem is known to exist. New and modern equipment, including an infra-red gas analyser, have been used in obtaining these records. Pollution figures have been obtained in city streets and in offices at various locations above street level. Smoke from heavy diesel vehicles is the main adverse feature, and this is particularly evident in the Newmarket results. This points to the need in a number of cases for better maintenance of transport fleets, and regular checks on their operating efficiency. (Author introduction)##

01912

D. A. Lynn and T. B. McMullen.

AIR POLLUTION IN SIX MAJOR U.S. CITIES AS MEASURED BY THE CONTINUOUS AIR MONITORING PROGRAM (CAMP). J. Air Pollution Control Assoc. 16, (4) 186-90, Apr. 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-92.)

Data obtained by the Continuous Air Monitoring Program (CAMP) in six cities during 2 years are summarized. Six gaseous pollutants were monitored in Cincinnati, Chicago, New Orleans, Philadelphia, San Francisco, and Washington, D.C. during 1962 and 1963. The data serve as a basis for describing several contrasts and similarities in the nature of air pollution experienced in six cities, which represent a broad geographical and climatological range of urban environments. Specific topics covered are: typical pollutant levels, patterns of daily and seasonal variations, and unusual phenomena such as atmospheric stagnation periods and photochemical smog formation. (Author abstract)**

01949

P. W. Hildebrand and R. L. Stockman

AIR QUALITY IN CLARK COUNTY, WASHINGTON. Washington State Dept. of Health, Olympia, Division of Environmental Health. 74 pp.

This is a report on a community air pollution survey which began Feb. 1, 1961 and which was conducted in cooperation with the Clark County Air Pollution Committee and the Clark-Skamania Health District. The following findings, and conclusions, are given. Clark County air pollution problems are primarily restricted to localized areas in the immediate vicinity of specific sources. Existing nuisance conditions and the potential for an area-wide problem in the near future warrant corrective and preventive action on the part of the community. Air pollution concentrations in Portland, Oregon are demonstrably higher than those measured in Clark County leading to the conclusion that area-wide pollution in the County will increase as community development progresses. Air pollution effects that can be established include fallout of solid materials, odor, soiling, and esthetic considerations. Heating and transportation make significant contributions to the total problem. Gaseous emissions and concentrations have not been studied sufficiently to establish their effects upon the community. Local legislation is presently inadequate to control the problem on either a corrective or preventive basis. This report recommends that an air pollution control district, as provided for by the laws of the State of Washington, be established encompassing Clark County and the cities of Vancouver and Camas.**

01981

A. P. Altshuller and I. Cohen

THE GAS PHASE REACTIONS OF NITROGEN OXIDES WITH OLEFINS. Intern. J. Air Water Pollution 4, (1/2) 55-69, 1961.

(Presented at the 134th Annual Meeting, American Chemical Society, Chicago, Ill., Sept. 1958)

The nature of the condensation products formed in the gas phase reactions of nitrogen dioxide and nitric oxide with pentene-1, 2-methylbutene-2, and 2-methylbutadiene-1,3 was investigated. The reactants were combined at partial pressures in the range of 0.1 to 2.5 mm with the total pressure at one atmosphere. The products were determined by infrared and ultraviolet spectroscopy and colorimetry. The condensates included primary and secondary nitro compounds and alkyl nitrates. Strong hydroxyl and singld bond carbon to oxygen stretching vibrations indicate the presence of either nitroalcohols or simple aliphatic alcohols formed through oxidation reactions. Carbonyl stretching frequencies observable in some of the reactions support the conclusion that a portion of the reactants disappear by oxidation rather than by nitration processes. The available results do not indicate the presence of appreciable amounts of tert.-nitrocompounds, conjugated nitro-olefins, or gem-dinitroalkanes. The reactivities of the olefins with the nitrogen oxides are in the decreasing order: 2-methylbutadiene-1,3, 2-methylbutene-2, pentene-1. (Author abstract)**

02129

A. P. Altshuller

AIR POLLUTION. Anal. Chem. 35, (5) 3R-10R, Apr. 1963.

Author presents a literature review in the field of air pollution, January, 1961 to February 1962. There are two hundred forty (240) references.**

02133

R. Baumann, E. Kadan, J. A. Schedling, and G. Wagner

(SOME MEASUREMENTS OF THE CONCENTRATIONS OF SOLID AND GASEOUS AIR POLLUTION IN THE VIENNA AREA.) Uber einige Messungen der Konzentrationen fester und gasformiger Luftverunreinigungen im Raum von Wien. Radex Rundschau (Austria) (4) 240-57, 1966.

Results of measurements of air pollution in the Vienna area during a two year period are reported; dust concentration was measured at one point, lead concentration was measured at various points in the city with approximately 50 random samples. Samples were also obtained at the same stations for the determination of sulfur dioxide and nitrogen oxide fumes. Dust concentration was higher during the winter months; maximum values during these periods were also much higher. Comparison with average monthly values in other European cities showed that Vienna has higher concentrations than Hamburg, Geneva and Copenhagen. The dust was analyzed chemically for its carbon and lead content, and figures compared with data from the USA. Concentration of gaseous air pollution decreased with distance from traffic lanes.**

02179

L. E. Niemeyer.

SUMMER SUN - CINCINNATI SMOG: A RECENT INCIDENT. J. Air Pollution Control Assoc. 13 (8) 381-4, Aug. 1963.

Three conditions are considered necessary for the formation of photochemical air pollution: sources emitting air pollution, slow atmospheric dispersal of pollutants, and solar radiation. As we have seen, all three conditions were fulfilled in Cincinnati on the 16th and 18th of May. The city acted as the source of pollution. Probably the greatest contributors were the city's inhabitants as they came into the city by car and bus to begin their daily routine. The stagnated anticyclone that dominated the region, with its attendant clear skies, light winds, and well-developed radiation inversion, brought about slow atmospheric dispersal of pollution and permitted the sun's rays to act on the contaminated air mass without obstruction. The intense solar radiation did produce the photochemical reactions, but also produced enough surface heating to mix the contaminated air mass to heights well above 5000 feet-alleviating, to a degree, the high concentrations that occurred before inversion breakup. The meteorological conditions that brought about this incident, although not frequent in southern Ohio, may be expected periodically. These conditions can lead to excessively high pollution levels if the sources of contaminants remain at their present number or increase in quantity.##

02241

W.H. Perry E.C. Tabor

NATIONAL AIR SAMPLING NETWORK MEASUREMENT OF SO2 AND ¬NO2. Arch. Environ. Health 4, 254-64, Mar. 1962. (Presented at the Industrial Hygiene Foundation of America, Inc., Pittsburgh, Pa., Oct. 25-26, 1961).

The air in the cities participating in the NASN is currently monitored for sulfur dioxide and nitrogen dioxide. The sulfur dioxide method used by the Network psssesses good collection efficiency and sufficient sensitivity for the levels encountered. Slight losses of pollutant may occur in the inlet system and on aging of the solution after collection; these losses are minimized by periodic replacement of the prefilters and prompt analysis of all samples on receipt from the field. The nitrate solutions collected in the nitrogen dioxide method have adequate stability, and no significant influence is exerted by the inlet system. The method is necessarily empirical because of low collection efficiency and incomplete knowledge of the reactions involved in the conversion of mixtures of oxides of nitrogen to the nitrite ion. (Author summary)##

02317

W.J. Basbagill J.L. Dallas

AIR QUALITY IN BOSTON, MASSACHUSETTS (NOVEMBER-DECEMBER 1963). Public Health Service, Cincinnati, Ohio, Div. of Air

Pollution. Nov. 1964. 55 pp.

A short-term air contamination pilot study was conducted using a mobile air-sampling laboratory. This laboratory, designed and constructed by the Technical Assistance Branch, Division of Air Pollution, Public Health Service, contains continuous automatic equipment for monitoring air quality, manual air-sampling equipment, meteorological instrumentation, and laboratory facilities. This mobile laboratory was used to: (1) obtain comprehensive measurements of gaseous and particulate air contaminants at a single test site, (2) train air-contamination investigators in the application of methodology, (3) evaluate and compare air-contamination measurement techniques, and (4) enhance public awareness of the air-contamination problem to encourage support for local air-contamination control and monitoring programs.##

02340

AIR QUALITY DATA FROM THE NATIONAL AIR SAMPLING NETWORKS AND CONTRIBUTING STATE AND LOCAL NETWORKS 1964-1965. Public Health Service, Cincinnati, Ohio, Division of Air Pollution pp. 128, 1966.

The Air Quality Section of the Public Health Service's Division of Air Pollution, with the assistance and cooperation of state and local agencies, carries on a variety of air sampling activities to obtain information about air quality in the United States. This report summarizes data gahtered during 1964 and 1965 at nearly 300 stations that gathered bi-weekly samples of suspended particulate matter, about 30 stations that gathered bi-weekly samples of two gaseous pollutants, and another seven stations that continuously monitored six gaseous pollutants, suspended particulates and soiling index. This volume also continues the policy of including summaries of data contributed by state and local agencies that operate their own air sampling networks. This effort to bring together in one publication as much air quality data as possible is particularly important in light of the continuing rapid expansion of state and local sampling activities. In addition to the basic data on suspended particulates and gases, data on several fractions of the particulate matter are included herein. (Author abstract)##

02822

S. Hochheiser and R. E. Wetzel

AIR POLLUTION MEASUREMENTS IN INDIANAPOLIS (JUNE-JULY 1963). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution and Bureau of Air Pollution Control, Indianapolis, Ind. 67 pp., July 1964

The Indianapolis Bureau of Air Pollution Control and the Division of Air Pollution, U.S. Public Health Service conducted a joint air pollution study in June and July 1963. A mobile air sampling laboratory was used in the study. This laboratory contains continuous automatic equipment for monitoring air quality, manual air sampling equipment, meteorological instrumentation, and laboratory facilities. This mobile laboratory is used mainly to (1) obtain comprehensive measurements of gaseous and particulate air pollutants at a single test site in various communities; (2) train air pollution investigators in the application of methodology; (3) evaluate and compare air pollution measurement techniques, and (4) enhance public awareness of the air pollution problem and encourage support for local air pollution control and monitoring programs. Some of the data obtained in this study, such as the range of concentrations of air contaminants, relationships among levels of air pollutants, and the relationship of meteorological factors and air pollution levels are presented here. Detailed tabulations of air pollution and meteorological measurements are given in the Appendix. (Author introduction modified)##

02823

S. Hochheiser, M. Nolan, and H. J. Dunsmore

AIR POLLUTION MEASUREMENTS IN DUQUESNE, PENNSYLVANIA (SEPTEMBER-OCTOBER 1963). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution and Allegheny County Health Dept., Duquesne, Pa., Bureau of Air Pollution Control. Oct. 1964. 37 pp.

Air pollution levels are of sufficient magnitude to justify further planning and development of the air resource management program serving the Duquesne area. Pollution due to particulate matter is a major problem. Atmospheric particulate concentration exceeded 290 micrograms per cubic meter 50 percent of the time. Pollution due to sulfur dioxide is also a major problem. Hourly sulfur dioxide levels reached 0.66 ppm during a period of relatively poor atmospheric ventilation. Photochemical-type smog was not detected nor was it expected during the fall season. The potential of photochemical smog in Duquesne is greatest during the summer months. The resources available should be increased to permit a more extensive air resource management program. A continuing air monitoring program should be instituted at strategic sampling sites throughout the area to determine seasonal and yearly trends of pollution, and to provide information upon which to base control program decisions.##

02825

T. E. Kreichelt and E. W. Dahle, Jr.

AIR POLLUTION MEASUREMENTS IN BALTIMORE, MD. (MARCH AND APRIL 1964). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution and Baltimore City Health Dept., Md., Bureau of Industrial Hygiene, Nov. 1964. 58 pp.
GPO: 817-288-2

Air pollution concentrations measured in this brief study are sufficiently great to justify further planning and development of an air resource management program in the Baltimore area. Conclusions based on the limited data of this study are as follows; Pollution due to particulate matter is higher than desirable. Atmospheric particulate concentrations exceeded 200 micrograms per cubic meter 5 out of 36 days of the study or 14 percent of the time. Soiling index values were rated as "heavy" or greater during 22 percent of the study period. Pollution due to sulfur dioxide is sometimes a problem. The average sulfur dioxide concentration during the study was 0.06 ppm but did reach an hourly concentration of 0.24 ppm. Photochemical-type smog was neither detected nor expected during the spring season. The relatively large concentrations of oxides of nitrogen, hydrocarbons, and aldehydes present suggest, however, that photochemically produced smog may be a problem during the summer months with the occurrence of greatest intensity and longest duration of sunlight. (Author conclusion modified)##

02840

G. B. Welsh and T. E. Kreichelt

CLEAN AIR FOR CHATTANOOGA. Public Health Service, Atlanta, Ga., (Region IV) and Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. July 1964, 77 pp.

The results of limited investigations, based on air quality data obtained during a 30-day sampling period, other available air quality data, evaluation of existing information related to the air pollution problem and a review of the present air pollution control program are presented. Of primary concern in Chattanooga are improper combustion of coal and fuel oil, particulate materials, odors, and fly ash. The sources are industrial, domestic, solid waste and open burning, and motor vehicles. Local meteorological and topographical factors contribute to the accumulation of air pollution in Chattanooga. Low-level inversions occur frequently (about 35 percent of the total hours per year). Although Chattanooga has had a smoke abatement program since 1935 and some progress has been made, there is an apparent need for a more comprehensive air pollution control program.##

03001

THE AUCKLAND AIR POLLUTION RESEARCH COMMITTEE (SEVENTH ANNUAL REPT. FOR YEAR ENDING MAR. 31, 1966.) Auckland Air Pollution Research Committee, New Zealand. 33 pp., 1966

The conclusion of the fourth annual survey in Auckland, New Zealand, is that no significant increases in air pollution have occurred in the last year. The specific areas of consideration are: (1) smoke levels, (2) odors, and (3) pollution by motor vehicles. The report reflects an increased awareness by the public of the air pollution problem and is exemplified by the adoption of smoke regulations.##

03013

S. Hochheiser, M. Burchett, H. J. Dunsmore

AIR POLLUTION MEASUREMENTS IN PITTSBURGH (JANURAY-FEBRUARY 1963). Public Health Service, Cincinnati, Ohio, Division of Air Pollution and Allegheny County Health Dept., Pittsburgh, Pa., Bureau of Air Pollution Control. 53 pp., Nov. 1963

Pollution detected in this brief study at one location is of sufficient magnitude to justify further, continuing studies of air quality in the Pittsburgh area. This work is necessary to rpovide air quality data for the determination of: (1) Extent of adverse effects of air pollutants, (2) trends in air quality, (3) effects of air pollution control regulations and other factors influencing pollutant emissions, and (4) plans for air resource management, including revision of emission regulations. Pollution levels observed during this brief study reasonably represented the average winter in Pittsburgh. Because, however, no period of severe atmospheric stagnation was encountered, the present study has not indicated the unusually high pollution levels that would occur at such times. Tentative, preliminary conclusions based on the limited data of this study are as follows: (1) Pollution due to particulate matter is above the average for urban centers in the United States, as indicated by measuremrnts of total suspended particulate matter. Soiling index, visibility, and atmospheric urbidity measurements confirm these data; (2) Concentrations of sulfur dioxide, carbon monoxide, and aldehydes tend to be slightly greater than suggested levels; and (3) Presence of photochemical smog was not demonstrated. Measurements of oxidant levels during late spring and summer may, however, cast a different light on this matter. Although oxidant measurements were very low in the current study, concentrations of hydrocarbons and nitrogen oxides were such that, at times of greater sunshine and lesser concentrations of sulfur dioxide, higher oxidant values could be expected.##

03024

SUMMARY OF DATA FROM THE CONTINUOUS AIR MONITORING PROGRAM. Public Health Service, Cincinnati, Ohio, Division of Air Pollution. Oct. 1965. 16 pp.

This report contains data gathered furing 1962, 1963, and 1964, with the data from 1964 presented more extensively than data from the earlier years. The annual average concentrations, the maximum and minimum monthly average concentration, and the maximum daily concentration of the several pollutants sonitored are summarized. The minimum daily average concentration was, in each case, below the minimum concentration detectable by the instruments. The following summaries are contained in tables: 1964 average and maximum pollutant levels in greater detail for the several cities. Relative cumulatively frequency distributions for 1964 3f basic CAMP data recoreded at 5-minute intervals, and similar distribution of data for 1962 and 1963. These frequency distributions permit the ready determination of the concentration that was exceeded only 5 percent of the time, the median concentration. Total oxidant data for 1964 in the form of the number and percent of day when the macimum hourly total oxidant concentration equalled or exceeded 0.15, 0.10 and 0.05 ppm, and the average and maximum soiling index levels for 1964.##

03027

J. D. Williams, F. D. Maddox, T. O. Harris, C. M. Copelev, Jr., and W. Vand Dokkenburg, Jr.

INTERSTATE AIR POLLUTION STUDY PHASE II PROJECT REPORT. VI. EFFECTS OF AIR POLLUTION. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control 66 pp., Dec. 1966

The Air Quality Goals Subcommittee, appointed under provisions of item 5-A-5 of the Interstate Air Pollution Study Phase II Project Agreement, reviewed literature, met with consultants in the air pollution effects field, and selected air quality goals for consideration by the Project Executive Committee. The Committee limited its consideration to goals because it does not have authority to adopt air quality standards, a function restricted to legally constituted governmental agencies. The Committee does, however, by approving this report, accept the consensus of professional and technical personnel. The explanations of effect levels presented herein were prepared by the staff of the Public Health Service Technical Assistance Branch who utilized the advisory resources available within the Division of Air Pollution. The effects of air pollution as a program element, is only one part of an air resources management program. Air pollution effects, air-quality levels, and pollutant emissions are the major program elements that provide the basis for air quality goals. Actually, if no consideration were given to the length of time needed to reach goals or to the priorities of community needs, air pollution effects would be the only program element to be considered in establishing goals. Suggested goals are listed and are based on the air quality (indicating major types and amounts of pollutants present) as well as actual and anticipated effects of air pollutants in the Interstate Air Pollution Study area. The effects of air pollution have been considered in this report from the viewpoint of a consultant whose task has been the development of a set of goals that will meet the future need of the area. Some of the quantitative relationships between effects and air quality levels have not yet been established, but enough is known that a guide for a constructive air resource management program has been provided for the Interstate Air Pollution Study area. This guide is intended to serve the needs of the study area only, and is not intended to have general application.##

03104

H.C. Wohlers M. Feldstein

INVESTIGATION TO DETERMINE THE POSSIBLE NEED FOR A REGULATION ON ORGANIC COMPOUND EMISSIONS FROM STATIONARY SOURCES IN THE SAN FRANCISCO BAY AREA. J. Air Pollution Control Assoc. 15, (5) 226-9, May 1965.

On the basis of evidence presented, it is concluded that photochemical smog is a major air pollution problem in the San Francisco Bay Area. Attempts should be made to reduce the intensity of photochemical smog effects by controlling the emission of organic compounds to the atmosphere. In order to reduce the intensity of photochemical smog effects in the Bay Area, it is estimated that an 80 percent total reduction of organic material emitted to the atmosphere is necessary. The nitrogen oxide problem needs clarification. Because of the complexity of the photochemical smog reaction in open atmospheres, technical answers to all phases of the problem are not available.##

03363

M. S. Sokoloskii, Zh. L. Gabinova, B. V. Popov, L. F. Kachor, and B. S. Levine, "Translator"

SANITARY PROTECTION OF MOSCOW ATMOSPHERIC AIR (U.S.S.R. LITERATURE ON AIR POLLUTION AND RELATED OCCUPATIONAL DISEASES, VOLUME 14). Moscow Sanitary-Epidemiological Station. 1965. 68 PP.
CFSTI, TT 67-60046

Moscow is a large industrial center with various types of industries discharging a complex of solid and gaseous, organic and inorganic chemical substances into the air, causing considerable damage to the National economy. This work reviews the Moscow Sanitary Service in its efforts to control air pollution from the many sources described.##

03404

D. S. Mathews J.J. Schueneman

MANAGEMENT OF DADE COUNTY'S AIR RESOURCES. Public Health Service, Cincinnati, Ohio, Division of Air Pollution. (In cooperation with Florida State Board of Health and Dade County Dept. of Public Health, Fla.) Oct. 1962. 43 pp.
HEW

Metropolitan Dade County has a long history of being a desirable area in which to live, work, and play. A great sub-tropical agricultural industry abounds. Tourism is one of the largest income producing industries in this area. Population and urban development are increasing rapidly. In general, these trends have to reduce agricultural income. Due to the dominance of tourism and agriculture, economic return has been somewhat uncertain ahd has not been balanced equally throughout the year. To compensate for this situation, a significant effort is being put forth to bring new kinds of income producing activities into Dade County. A specific proposal has been made to construct and operate a petroleum refinery near Homsestead as part of an extensive industrial development. The Dade County Manager and the Dade County Department of Public Health requested technical assistance from Florida State Board of Health and the United States Public Health Service in reviewing the refinery proposal, evaluating it spossible environmental effects and in planning a long range air resource management program. Air pollution aspects are considered and presented herein. (Author introduction modified)##

03406

R. L. Mecham, J. S. Ameen, R. W. Slater, Jr.

A PILOT STUDY OF AIR QUALITY IN WINSTON-SALEM, NORTH CAROLINA (NOV. 28 - DEC. 5, 1962). Public Health Service, Cincinnati, Ohio, Division of Air Pollution; North Carolina State Board of Health; and Forsyth County Health Dept., N.C. Apr. 1963. 29 pp.
HEW

A one-week pilot study covering a limited number of pollutants at a single location is reported for a short period of the year during which the wind speeds were two to three times the normal values for the season. Such abnormal wind conditions had a considerable effect on the results of the study. Even under these favorable conditions for dispersion of pollutants, high soiling index values were observed. Oxidant concentrations indicated the possibility that photochemical smog may be a problem. Infrequent peak concentrations of sulfur dioxide indicated that it may be a possible probelm source. Recommendations made were based on the data collected in this one-week sampling study and other available data. There are figures on the variation of gaseous pollutants and soiling index, and tables on measurement of carbon monoxide, hydrogen sulfide, oxidants, nitrogen oxides, nitrogen dioxide, sulfur dioxide and soiling index.##

03407

Q. M. Mees R. L. Wortman

PRELIMINARY REPORT AIR POLLUTION SURVEILLANCE STUDY, TUCSON, ARIZONA. Arizona Univ., Tucson, Coll. of Engineering. (Engineering Experiment Station Bulletin No. 13, Civil Engineering Series No. 6.) Aug. 1960. 64 pp.

A study of recent population figures as well as prevailing meteorological conditions in the Tucson area provides ample evidence that these conditions are prevalent. Visual evidence of the growing problem becomes obvious when viewing the Tuscon valley from vantage points provided by the surrounding mountain ranges. In order to attempt an evaluation of the problem as well as provide basic data for future studies of a comparative nature, it was decided that a jointly sponsored project be proposed to extend over a ten-month period beginning in September, 1959. In addition to providing surveillance data, the program was to serve both research and instructional purposes in Sanitary Engineering at The University of Arizona. The U.S.P.H.S., through its Region IX office, and the Arizona State Health Department were to cooperate by rpoviding technical consultation, some air pollution equipment loans, and certain manpower assists. The project was to be conducted within the framework of the Engineering Experiment Station of The University of Arizona. The period of sampling extended from September 10, 1959 through June 14, 1960 During the regular sampling days throughout the sampling period, observations were made for oxidants, nitrogen dioxide, nitric oxide, sulfur dioxide, carbon dioxide, and particulate matter. The period of testing extended from 7 A.M. through 5 P.M. Beginning January 1, 1960, the U. S. Public Health Service established a National Air Sampling Network Station at The University of Arizona. Operation of this station involves collecting a 24-hour High Volume air sample twice a month and sending it to the Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, for analysis. Although the gaseous pollutant levels could not be considered as high levels of pollution when compared to a city such as Los Angeles, it should be pointed out that the population of Los Angeles is approximately twenty times that of Tuscon. Data from the U.S. Public Health Service's National Air Sampling Network (an average of 141 cities) over the two-year period of 1957 and 1958 showed an average pollution of 130 micrograms per cubic meter for the Tucson area for the subject sampling period. Oxidant concentrations compared very favorably with other cities.##

03409

G. J. Raschka

AN APPRAISAL OF AIR POLLUTION IN MINNESOTA. Minnesota Dept. of Health, Minneapolis, (In cooperation with the Public Health Service.) Jan., 1961. 78 pp.

This appraisal of the air pollution situation in Minnesota arose from a growing concern about air pollution problems in the state. Increasing requests for information and assistance registered with the State Department of Health Service were obtained concerning methods of conducting a survey which would establish the nature and extent of the air pollution problem in the state and indicate what activity is needed on the part of the state and local governments in meeting the problem. Data used in preparing this report were obtained by interviews, direct observation, questionnaires, limited air sampling, and review of existing information. The appraisal was made from October 1959 to July 1960.##

03426

E. C. Tabor, J. E. Meeker, and J. M. Leavitt.

AIR POLLUTION IN ST. BERNARD, OHIO. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution,1958. 17 pp. HEW

An area survey was conducted in St. Bernard, Ohio. It was determined that the levels of suspended particulates and crude organics were considerably higher than that in downtown Cincinnati for the same days. The average levels of 270 micrograms of suspended particulate per cubic meter of air and 65.5 micrograms of crude organics per cubic meter of air were somewhat higher than for other communities of size comparable to St. Bernard. Nitrate and sulfate concentrations also were slightly higher. The highest levels of sulfur dioxide, while not high enough to be of great concern, were associated with northerly winds. On several occasions the level of oxides of nitrogen was high enough to be detectable by the odor. The large amount of aliphatic hydrocarbons in the organic matter was very unusual. It was considerably higher than that from any other community in the United States for which similar measurements have been reported. The soiling power of the air was higher when the wind blew from the North.##

03433

F. A. Bell, Jr., G. Bisel, Jr., T. N. Hushower,
L. B. Perry, F. J. Schuette, and E. Vihman.

FRESNO AIR POLLUTION STUDY. Public Health Service, Washington, D. C., Div. of Air Pollution; California

State Dept. of Public Health, Berkeley; and Fresno County Health Dept., Calif. July 1960. 25 pp.
HEW

Haze and other air pollution effects have occurred in the Central Valley of California. In order to answer questions regarding present pollution levels and to estimate the future pollution potential of an area which is just beginning to experience air pollution, Fresno was selected as a representative growing metropolitan area of the Central Valley. Air pollution concentration levels together with visibility reduction measurements and subjective observations indicate that photochemical smog occurs in the Fresno area. The Fresno rural station in Kerney Park had AISI particulate matter results which were in general higher than the results at the Fresno city station. AISI particulate matter results indicate that episodes of air pollution occur widely throughout the Valley. Comparisons of average results from stations at Feesno, at Kearney Park, Sacramento, Stockton and Bakersfield show that the AISI results were two to four times higher for the December 3-9 period than for the September 10-17 period for all stations. An estimate of pollutants being emitted to the atmosphere indicates that motor vehicles are the main and most significant sources of smog-forming raw materials in the Fresno area.##

03434

F. A. Bell, Jr., W. J. Beck, J. H. Shrimp, and G. B. Welsh.

A PILOT STUDY OF AIR POLLUTION IN WASHINGTON, D.C. Public Health Service, Washington, D.C., Div. of Air Pollution. Dec. 8, 1960. 19 pp.
HEW

The study covered seven days, including one weekend, and one all-night sampling period for intensive air pollution sampling. The period covered was December 2 through December 8, 1960, from 9:00 AM to 5:00 PM. The all-night sampling period covered 9:00 AM, December 5 through 9:00 AM, Dememober 6. The gas and particulate pollutants under test were selected to be indicative of the general air pollution of the area. Oxidant, nitrogen dioxide, nitric oxide, carbon monoxide, smoke and particulate were sampled. Visibility measurements to ground level objects were taken every hour. The roof of the seven-story District of Columiba Municipal Center Building, 300 Indiana Avenue, N.W., was selected as the sampling site. The following equipment was used in the study: Multiple gas sampling apparatus; High volume particulate sampler; AISI automatic smoke sampler; and Sepctronic "20" analyzer.##

03441

CLEAN AIR FOR CALIFORNIA (INITIAL REPORT OF THE AIR POLLUTION STUDY PROJECT, CALIFORNIA STATE DEPT. OF PUBLIC HEALTH). California State Dept. of Public Health, San Francisco. Mar. 1955. 60 pp.

This is an early survey report of the air pollution situation in California. The body of knowledge, available at that time, on the growing problems of polluted air is discussed and a plan for action outlined. Attention is focussed on the air pollution problem in the Los Angeles area, where eye irritation, plant damage and other harmful effects, such as discomfort, decreased visibility and nuisance occur most frequently. Recommendations to State and local Governmental authorities, to universities and other research organizations, to the industry and public are made.#
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03454

W. C. Cope, Chairman.

SMOKE AND AIR POLLUTION - NEW YORK - NEW JERSEY. Interstate Sanitation Commission, New York City. Feb. 1958, 95 pp.

Pollution in the metropolitan area was studied by: aerial reconnaissances and photography; and surveys in the communities. Significant information was collected on: relationships of meteorology, visibility and pollution; interstate movement of pollution as indicated by releasing tracer dust in one state and collecting in the other; amount of vehicle exhaust fumes and other organic materials in the air; sulfur dioxide concentration on Staten Island, and ozone on Staten Island and in Carteret, N.J.; effects of the polluted atmosphere on health, vegetation, materials and transportation; and a study and evaluation was made of existing laws in the State of New York, New Jersey and Connecticut, and other jurisdictions. Air pollution originating in regions of New York and New Jersey within the New York Metropolitan Area is interstate in character, affects public health and comfort adversely, and damages property. While the control and abatement of air pollution at its sources is the primary obligation of the states, counties or municipalities in which it originates, the problems of interstate air pollution cannot be solved wholly by governmental agencies independently of one another. The abatement of existing interstate air pollution and the control of future interstate air pollution is of prime importance to the persons living and industry located in the area affected thereby, and can best be accomplished through the cooperation of the states involved, by and through a common agency or instrumentality. An interstate instrumentality, employing the administrative practices followed by the Interstate Sanitation Commission in the abatement of interstate water pollution, should be created to deal with the problems of interstate air pollution. Drafts of proposed legislation to meet the situation described in this report should reflect fully the opinions and needs of many agencies, local governing bodies, members of the Legislatures, representatives of industry, and of the public. There has been insufficient time between the completion of the study and the submission of this report to afford opportunity to interested agencies to express their views on the form which legislation to abate interstate air pollution should take.##

03458

D. M. Keagy and J. J. Schueneman

AIR POLLUTION IN THE BIRMINGTON, ALABAMA, AREA. Public Health

Service, Cincinnati, Ohio, Div. of Air Pollution. (Rept. No. A58-8.) May 1958. 80 pp.
HEW: A58-8

The purposes of this survey were to: (1.) Review the existing and potential air pollution situations. (2.) Review existing air pollution control activities; and (3.) Develop recommendations for organization, staff, facilities, program, and legislation relative to air pollution control activities. The scope of the study was limited to consideration of available information relative to air pollution including: types of activity which cause pollution, evidences of pollution levels, meteorological and topographical influences on the dispersion of pollutants, existing or authorized governmental activity for control of air pollution, and other relevant community characteristics. The study area was the boundary of Jefferson County.##

03462

E. E. Lemke, N. R. Shafter, and J. A. Verssen

SUMMARY OF AIR POLLUTION DATA FOR LOS ANGELES COUNTY. Los Angeles County Air Pollution Control District, Calif., Engineering Div.

Emission concentrations of pollutants for Los Angeles, California are given. The levels cited are a result of the Board of Supervisors of Los Angeles giving the authority to the Air Pollution Control District - County of Los Angeles. Also included are sixty-two (62) industrial control programs started in the Los Angeles area, along with the dates installed and the cost.##

03467

R. I. Larsen

BASES AND TYPES OF AIR QUALITY CRITERIA. Preprint. 1964.

Article is an evaluation of present air quality criteria and recommendations for future considerations. The salient points considered were the following: (1) Conduct research to establish what pollutant concentration or combination of pollutant concentrations cause what effects, (2) Decide which adverse effect to protect against and, (3) Choose pollutant concentration below the threshold that will cause the undesired effect.##

03468

M. D. High, R. W. Slater, and G. G. Costantino

A PILOT STUDY OF AIR POLLUTION IN PROVIDENCE, RHODE ISLAND. Public Health Service, Cincinnati, Ohio, Robert A. Taft Engineering Center. (Rept. No. A62-15.) June 1962. 49 pp.
HEW: A62-15

This study covered two equal periods of 15 sampling days each. Samples were collected for determination of sulfur dioxide, nitric oxide, nitrogen dioxide, carbon monoxide, and total oxidants, on a bi-hourly basis. Visibility from the sampling site was determined on the same schedule; photographs were taken to document visibility restrictions. Particulate pollution levels were monitored continuously in three ways. Soiling index was determined with the AISI strip filter paper sampler with a 4-hour sampling time; suspended particulates were collected on a 24-hour basis for determination of total weight; and a single dustfall sample was collected over the entire period of each phase of the study. Methods of measurement are described in the appendix, and the primary sources of pollutants are listed.##

03504

E. R. Hendrickson, D. M. Keagy, and R. L. Stockman

EVALUATION OF AIR POLLUTION IN THE STATE OF WASHINGTON (A JOINT REPORT WITH THE STATE OF WASHINGTON DEPARTMENT OF HEALTH-JULY 1 THROUGH NOVEMBER 30, 1956). Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. 1957. 165 pp.

The objective of this study was to estimate the current and potential air pollution problems in the State of Washington and to provide a basis for the State to determine the appropriate action it should take. The survey consisted of a study of population distribution and trends, geography and topography, meteorology and climatology, and existing and potential sources of pollution. The sources of pollution which were considered include transportation, domestic activities, agricultural practices, industrial activities, refuse disposal, out-of-state sources, and natural sources. In addition, a determination was made of available resources in the State for research and investigation in air pollution problems. On the basis of the findings of this state-wide survey, it is recommended that: (1) Air pollution be recognized as a matter of State concern. (2) Ways and means of prevention and control of air pollution, including consideration of local and regional aspects, be investigated. (3) A continuing State program include surveillance, study and cooperation and (4) An agency be designated to represent the State in interstate and Federal air pollution matters.##

03505

M. D. Hornedo and J. H. Tillman

AIR POLLUTION IN THE EL PASO, TEXAS AREA. El Paso City - County Health Unit, Texas. 1959. 104 pp.

The primary purpose of this study was to obtain basic scientific air pollution data concerning the type, extent, source, and effect of the waste from industry and other air pollution in the El Paso area. Another purpose was to determine the need and nature of a permanent air pollution control program. The scope of the program was limited by two factors; the gathering of those samples which were within our means to analyze and the collection of pollutants commonly found in any city.##

03506

P. A. Kenline

AIR POLLUTION IN CHARLESTON, SOUTH CAROLINA. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. (Rept. A60-6.) 1960. 32 pp.
HEW: A60-6

At the request of the South Carolina Department of Health and with the cooperation of the Charleston County Health Department, the Public Health Service made an appraisal of factors relating to air pollution in the Charleston area. The purpose of this appraisal was to determine the status of the air pollution situation, and the need for government activity in solving air pollution problems. This report is an analysis of information collected relating to sources of pollutants, dispersion of pollutants, indication of pollution levels, and the status of local activity in the air pollution field. Charleston lies in an area of frequent stagnating high pressure systems - the meteorological model associated with major air pollution episodes - and for this reason bears surveillance. However, because of its proximity to the Atlantic Ocean and its level topography, Charleston usually receives good ventilation in part because of the sea breeze. This advantageous phenomenon decreases inland. The atmospheric pollutants of immediate concern derive from industrial sources. However, domestic, commercial, and municipal sources do contribute to the overall pollution load of the atmosphere. To date, public complaints relate to nuisances, particularly industrial odors. There have also been a few allegations of vegetation and property damage. Measurements by the Public Health Service's National Air Sampling Network in the City of Charleston indicate that the particulate loading is not excessive, as judged by comparison with cities of comparable size. The sampler is located in the center of the city and is not indicative of pollution levels in other areas. Of greatest interest and concern is the North Charleston "neck" which contains within a limited area a complex of air pollutant sources and residences. No data are available to indicate pollution levels in this area, although analysis of the Network data implies that they are significantly higher than in the city. There is presently no local or State air pollution program, nor is there routinely available to the local area any agency with authority and competence in this field. On the basis of this appraisal and the general available knowledge relating to air pollution, the following recommendations are made to the Charleston County Health Department. (1) Information should be developed relating in detail to air pollution levels and sources in the Charleston area, particularly to the north of the city limits. (2) A modest public education program should be undertaken. (3) A modest air pollution program should be developed within the County Health Department. (4) In

03510

O. Paganini, M. D. High, and P. A. Kenline

APPRAISAL OF AIR POLLUTION IN TEXAS (REPORT OF A COOPERATIVE SURVEY BY THE TEXAS STATE DEPARTMENT OF HEALTH AND THE U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, PUBLIC HEALTH

SERVICE, DECEMBER 1957 THROUGH 1958). Texas State Dept. of Health, Austin. 1958. 112 pp.
HEW

This state-wide appraisal of the factors relative to air pollution in Texas resulted from the interest and concern expressed by citizens and organizations in the State. Realizing the need for action, the Texas State Department of Health requested assistance from the United States Public Health Service in conducting a general appraisal to determine the status of air pollution in the State and the need for additional activity on the part of the State government in meeting its air pollution problems. Data used in preparing this report were obtained by interviews with informed individuals, by direct observations, by questionnaires, and by review of existing information. Information was secured which would indicate the occurrence of air pollution problems, the general nature of local control programs, the presence of potential pollution problems and adverse pollution factors, and the need for future activity to insure adequate protection of the vital air resources of the State. The appraisal was conducted from December 1957 through July 1958. Air pollution problems exist in many areas of the State. Of the 71 larger cities in the State, to which field visits were made, over three-fourths (56 cities) were found to have objectionable air pollution in their area. Of the 410 questionnaires returned from the city and county health officers of the smaller towns and rural areas of the State, 194 indicated the presence of objectionable pollution. Very little work in the air pollution field is currently being done. In the absence of a definite state air pollution law and of specific appropriations for the purpose, the activities of the State Health Department in this field are limited to investigation of complaints when requested by the local health departments. (Author summary modified)##

03513

A PILOT STUDY OF AIR POLLUTION IN LYNCHBURG, VIRGINIA. Public Health Service, Washington, D.C. and City of Lynchburg, Va. Feb. 1961. 25 pp.

Results of a one-week air pollution survey in Lynchburg, Virginia, revealed the following: 1. The levels found give a clear indication that Lynchburg has an air pollution problem. 2. The levels found for soiling capacity and particulate matter indicate the presence of a general smoke problem. 3. The visibility standard for ambient air of the California State Health Department (less than three miles at less than 70 percent relative humidity) was exceeded on six days, another indication of high particulate levels and smoke. 4. A combination of meteorological conditions, including low wind speed, temperature inversion, and a haze layer at the top rim of the James River Valley were noted on February 15. The highest levels of general air pollution for the entire sampling period occurred during this period and appear to be attributable to the combined meteorological conditions. 5. The high level of sulfur dioxide is comparable to levels found in many large population centers or highly industrialized areas. The levels for some of the gaseous pollutants are about average for urban areas; however, under conditions of low wind speed and temperature inversion, they may accumulate until much higher levels are reached.##

03514

ATMOSPHERIC POLLUTION IN THE GREAT KANAWHA RIVER VALLEY INDUSTRIAL AREA. West Virginia State Dept. of Health, Charleston, Bureau of Industrial Hygiene and Cincinnati Univ., Ohio, Kettering Lab. 1952. 184 pp.

The purpose of the survey was to (1) establish factual information as to the atmospheric pollution problem of the valley, (2) compare the present particle-fall load of the valley to that of a previous survey made by the Bureau of Industrial Hygiene, West Virginia Department of Health from June 1945 to December 1947 and (3) to determine the present or future needs of establishing an agressive air pollution control program for the area. The total daily load of particulate solid matter discharged to the atmosphere was found to be approximately 500 tons, derived mostly from burning or processing of coal; that of gases, fumes, and vapors, most of which are sulfur gases from the use of coal, amounted to about 370 tons. While the particulate matter (fly ash, etc.) can be controlled to acceptable levels through selection of coal and installation of collectors, it does not appear that there is any prospect of "cleaning up" the valley completely, although there is evidence that much more can be accomplished by economical means. It is further indicated that even with a consistent uniform daily loading of the atmosphere with particulate matter, the ground level concentrations may vary greatly, depending upon meteorological conditions. The elimination of sulfur dioxide arising from the use of coal is an extremely difficult problem, since low sulfur coal is not obtainable locally in sufficient quantity, while chemical methods of control would be economically prohibitive at the present time. Odors, which are extremely annoying at times, have not been explained satisfactorily in many cases. Analytical methods of identification are not available except in a few cases, although special equipment might be valuable in identifying such contaminants. Greater assistance from industry is required to identify such materials, to determine their toxicity and to establish the quantities discharged into the atmosphere. Two episodes of eye irritation of fairly severe character occurred in 1951. While these were of short duration, they served to indicate that pollution in the valley, under adverse conditions, can cause demonstrable ill effects. (Author summary modified)##

03701

J. Cholak, L. J. Schafer, W. J. Younker, and D. W. Yeager

THE RELATIONSHIP BETWEEN SULFUR DIOXIDE AND PARTICULATE MATTER IN THE ATMOSPHERE. Am. Ind. Hyg. Assoc. J. 19, (5) 371-7, Oct. 1958. (Presented at the 19th Annual Meeting, American Industrial Hygiene Association, Atlantic City, N.J., Apr. 24, 1958.)

The purpose of this aerometric survey was to study the relationship between the selected pollutants in the natural photochemical formation of the oxidant type smog. This paper describes the features and the patterns of occurrence of particulate matter and sulfur dioxide as observed in Cincinnati since 1946. The findings obtained in the survey permit interesting comparisons with those obtained in earlier surveys.##

03725

C. R. Hosler

NATURAL RADIOACTIVITY (RADON-222) AND AIR POLLUTION MEASUREMENTS IN WASHINGTON, D. C. J. Appl. Meteorol. 5, (5) 653-62, Oct. 1966.

Atmospheric concentrations of radon (Rn222) were measured at urban, suburban and rural sites in the Washington, D.C., metropolitan area during a stagnant weather regime in mid August 1965. An analysis of air quality data, radon concentrations and meteorology indicates that the stagnant weather conditions which lead to the accumulation of smoke, haze and gaseous pollutants in the air, are conducive to the accumulation of radon in the lower atmosphere. During maximum stagnation radon concentrations were 2-4 times higher than normal; the high levels of natural radioactivity reflect the limited volume of air available for dilution, caused by a restriction to vertical mixing that prevailed throughout the stagnant period. This case study suggests that high concentrations of natural radioactivity will be indicative of air pollution potential conditions existing in the atmosphere. Also, air quality data indicated that heavy rains and vigorous mixing associated with a squall line were ineffective in cleansing or displacing, for a significant length of time, the polluted air mass. (Author abstract)##

03714

J. Cholak and L. J. Schafer

THE CONCENTRATIONS OF OXIDANT (OZONE) AND NITROGEN DIOXIDE IN THE AIR OF CINCINNATI, OHIO. Am. Ind. Hyg. Assoc. J. 21, 452-8, Dec., 1960. (Presented at the 21st Annual Meeting, American Industrial Hygiene Association, Rochester, N.Y., Apr. 25-28, 1960.)

The purpose of this paper is to describe observations concerning the concentrations of oxidant, nitrogen dioxide and nitric oxide. The frequencies of the occurrence of certain average hourly concentrations of oxidant and nitrogen dioxide in the air at the three stations and of nitric oxide at the Avondale station are illustrated graphically. Higher concentrations of oxidant were found in the Avondale section of the city. Values in excess of 1 pphm occurred 50% of the time at the Avondale station, 38% of the time at the perimeter residential station (French Park) and only 26% of the time at the downtown station. An average hourly concentration in excess of 10 pphm was never reached at the downtown station and occurred only 0.01 and 0.05% of the time at the French Park and Avondale stations respectively. The order of rank of the three stations with respect to the levels of concentration of nitrogen dioxide differed from that shown by the oxidant. The levels of concentration were higher in the downtown area, and decreased in the air at the two residential areas in accordance with their distance from the central core area of the city. Concentrations of nitrogen dioxide, averaging less than 1 pphm per hour were found 44% of the time at the French Park area, 14% of the time at the Avondale station and only 2% of the time at the downtown station. Data on nitric oxide were collected for several months during 1958 and 1959 only at the Avondale station. These data indicate that the average hourly concentration in Avondale was less than 1 pphm for 84% of the time. Average hourly concentrations in excess of 10 pphm occurred only 0.5% of the time.##

03715

J. Cholak, L. J. Schafer, D. Yeager, and W. J. Younker

GASEOUS CONTAMINANTS IN THE ATMOSPHERE. A.M.A. Arch. Ind. Health 15, 198-206, Mar. 1957. (Presented at the Air Pollution Symposium, 130th Meeting, American Chemical Society, Atlantic City, N.J., Sept. 17-21, 1956.)

This paper deals with the concentrations of oxidant, nitrogen dioxide, sulfur dioxide, and carbon monoxide found in the air in the course of prolonged tests during three seasons of the year. The concentration of sulfur dioxide in the air of Cincinnati varied with the season. It was lowest during the summer when the combustion of solid fuel was at a minimum. The level of concentration of oxidant as recorded by the potassium iodide recorder varied inversely with the concentration of the sulfur dioxide present. The highest levels of concentration were found during the summer season. The oxidant usually reached its maximum value during the afternoon and was lowest during the night. The concentration of oxidant in the atmosphere of Cincinnati ranged between 0.2 pphm and 6 pphm. The diurnal fluctuation in the concentrations of nitrogen dioxide indicated that the concentrations were generally higher at night than during the daytime. The lowest levels of concentration were found during periods when the oxidant reached its highest value. The levels of concentration of nitrogen dioxide ranged between 0.2 and 9.5 pphm. The concentration of carbon monoxide in the air during all three periods was very near the limit of detection of the method employed, being below 1 ppm generally.##

04616

J. E. Dickinson

AIR QUALITY OF LOS ANGELES COUNTY (TECHNICAL PROGRESS REPORT - VOLUME II). Los Angeles County Air Pollution Control District, Calif. Feb. 1961. 306 pp.

Volume II of the Technical Progress Report is concerned with chronicling the air monitoring program of the Los Angeles County Air Pollution Control District between 1951 and 1959. Topics covered include: Chemistry of the Atmosphere; Air Monitoring; Evaluation of Smog Effects Data; Estimation of Total Air Pollution in Los Angeles County; Utilization and Analyses of Total Air Pollution Data. Without the data accumulated as the result of the sampling programs of 1951-57 it would not have been possible to discover the unique problems involved with Los Angeles smog and to determine what kind of control measures would be needed to abate them. Thus, it was possible (1) to identify in the atmosphere the contaminants considered to be the most important with regard to photochemical smog formation theory; (2) to establish their approximate concentration ranges; (3) to confirm theories of photochemical smog formation and transport; and (4) to define the areas of the Basin most severely affected by smog and the areas in which most of the contaminant sources were concentrated. Correlation between meteorological trends and smog occurrence, without radical change in emission concentrations, indicate the importance of weather conditions to smog occurrence.##

04651

B. T. Commins R. E. Waller

OBSERVATIONS FROM A TEN-YEAR-STUDY OF POLLUTION AT A SITE IN THE CITY OF LONDON. Atmos. Environ. 1, (1) 49-68, Jan. 1967.

As part of an extensive study of the effects of air pollution on health, measurements of pollution have been made at a site in London for more than ten years. The results of daily measurements of the concentration of smoke and sulfur dioxide made throughout that period and of more frequent measurements made during episodes of high pollution are reported. These show a reduction in the annual mean and peak concentrations pf smoke during the ten year period, but there have not been any significant changes in the concentrations of sulfur dioxide. Occasional measurements of a wide range of other pollutants are also reported and results from a series of measurements of polycyclic aromatic hydrocarbons indicate a decline in the concentration of this potentially carcinogenic component of pollution in London. (Author abstract modified)##

04770

J. F. Yocom, J. A. Farrow, R. E. Gagosz and J. C. Magyar

AIR POLLUTION STUDY OF THE CAPITOL REGION (INTERIM REPORT). TRC Service Corp., Hartford, Conn. 1968. 65 pp.

The objectives were: (1) Evaluate the air pollution problem in the Capitol Region, both existing and potential with emphasis on the latter. (2) Procure data for determining the need for a regional air pollution control program and delineate rational boundaires for such a program. The purpose of this Interim Report is to present and summarize the completed Source Inventory and to report on the status of the other phases of the study. The pattern of air pollution emissions is strongly related to land use and road systems and is regional in nature. Although the towns making up the Capitol Region differ widely in character , the pattern of emissions are not related to town boundaries. Carbon monoxide emissions are related almost entirely to automobile use. Automobiles are also the principal contribution to hydrocarbon emissions, but home and municipal refuse burning and industrial processes make significant contributions. Nitrogen oxides are contributed in almost equal amounts by automobiles and heating systems. This accounts for the relatively even distribution of this pollutant. Sulfur oxides are produced mainly in industrial heating and power generation plants burning high sulfur fuel. Therefore the emission of this pollutant type is clearly related to industrial land use. Particulate matter is produced largely by industrial heating and manufacturing processes with significant contributions from domestic and municipal refuse burning. The distribution of particulate emissions is dependent to some degree on land used for heavy industry such as metallurgical and mineral processing. Levels of pollutants measured were, in general, low. Except for a few days, weather conditions readily dispersed pollutants before they could accumulate. High concentrations of pollutants occurred during a prolonged stable atmospheric condition during late November as recorded by the State Department of Health. The differences in pollutant levels from station to station, could, in general, not be accounted for based on surrounding land use and estimated emissions (Source Inventory) without specific knowledge of the prevailing weather patterns. Inversions occur frequently during the night and early morning hours in both the Connecticut and Farmington Valleys. Only two of the towns in the Capitol Region have specific regulations governing emissions of air pollutants. Most of the towns have some measure of control over potential air pollution emissions by means of zoning ordinances.##

04833

H. H. Hovey, Jr.

AIR POLLUTION IN WESTCHESTER. Westchester Cooperative Air Pollution Control Study, Westchester County, New York. (In cooperation with Mount Vernon City Health Dept., New Rochelle City Health Dept., Westchester County Health Dept., and Yonkers City Health Dept.) 1965. 86 pp.

Within the framework of the New York State Air Pollution Control Act a series of air pollution surveys was initiated to provide data for carrying out the directive in the law. Among these was a comprehensive study of the air pollution potential in Westchester County, undertaken from July, 1962, until September, 1964, as a cooperative effort by the Mt. Vernon, New Rochelle, and Yonkers City Health Departments and the Westchester County Health Department. The objective of this study was to define the nature and extent, and causes and effects of the air pollution potential in Westchester County. Both the industrial and nonindustrial air pollution potential were studied by conducting an inventory of possible air contaminant sources to determine contaminant emissions within the county. The inventory was supplemented by an atmospheric sampling network consisting of 23 stations located throughout the county. Recommendations were based on the findings from combined inventory and atmospheric sampling data. Many problems are created by the 182,000 tons of air contaminants (exclusive of CO, estimated to be more than 830,000 tons per year) emitted annually to the outer air in Westchester County, although there are no major county-wide air pollution problems. Traffic concentrations in the southern portions of the county tend to increase the potential problem from CO. Westchester County has a meteorological regime relatively favorable to good dispersion and diffusion of contaminants in the atmosphere. Only 23% or 42,000 tons of Westchester County's air contamination comes from industrial sources while 78% or 140,000 tons of the total contamination comes from nonindustrial sources. Of this amount over 100,000 tons comes from motor vehicle and other transportation sources. Southern Westchester County is densely populated and has most of the county's industry with the exception of the villages of Dobbs Ferry, Elmsford, Larchmont, North Pelham, Pelham and Scarsdale, and the City of Rye.##

04834

New York State Air Pollution Control Board, Albany. 1965.
15 pp.

AIR POLLUTION/CHEMUNG COUNTY (SUPPLEMENT TO COMPREHENSIVE AREA SURVEY REPORT NUMBER ONE (GREATER ELMIRA).

Since the degree of air pollution is low in this rural portion of Chemung County, proper steps would be taken to insure continuing low levels of air contaminants. All new sources of air pollution can be controlled by adherence to rules and regulations promulgated by the New York State Air Pollution Control Board in 1962. Local officials, in cooperation with the Board, can insure new sources or modifications to existing sources and meet minimum requirements as established by the Board. Rules and regulations for this area should be made at the same time as those for Greater Elmira, using ambient air quality objectives as promulgated by the Board. When applying the ambient air quality objectives, both the present survey area and Greater Elmira should be classified as one region. In this manner, all of Chemung County may have a uniform set of rules and regulations at the same time. Refuse disposal practices should be reviewed in each community. Open burning of refuse by private individuals should be prohibited and central collection instigated. Disposal should be properly-operated, sanitary landfills or any other acceptable method. (Author summary)##

04864

New York State Air Pollution Control Board Albany. 1964.
96 pp.

AIR POLLUTION - NIAGARA COUNTY (COMPREHENSIVE AREA SURVEY Report number three).

The objectives of this study are to define the nature and extent of the air pollution potential in Niagara County so as: (1) To provide information by which rules and regulations can be established for the control of existing air pollution; (2) To provide technical data needed for implementation of a practical and reasonable air pollution abatement program; (3) To assess the effectiveness of existing controls and determine what steps must be taken by governmental agencies to control both existing and potential air pollution; and (4) To provide background data needed to check the effectiveness of any future control program.##

04986

J. Cholak

THE NATURE OF ATMOSPHERIC POLLUTION IN A NUMBER OF INDUSTRIAL COMMUNITIES. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 6-15.

An expanded electrostatic precipitator sampling program for investigating certain more general characteristics of the air pollution of Cincinnati was resumed in 1946. Starting with twelve sampling sites, the program was gradually enlarged in scope during the period 1946-51 to include the measurement of a number of gaseous pollutants as well as determinations of the composition of the particulate matter suspended in the air. Various other pollutants were included in the investigation as facilities for collecting samples and techniques for their analysis were improved. During this same period opportunities presented themselves for the study of pollution problems of a number of other communities. Since these data, obtained by comparable methods, are of interest in showing the similarities and differences in the character of the atmospheric pollution of various communities, it is our purpose (1) to describe the nature of the air pollution of Cincinnati, (2) to compare the Cincinnati data with the findings obtained during the course of shorter studies in other communities, and (3) to amplify the picture with results of observations reported in the literature. In making such use of the data of other investigators the analytical approach has been given careful consideration in order to make certain that comparable data were being dealt with.##

04996

M. Katz

SOURCES OF POLLUTION. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 95-105

The wind and cloud conditions in the Detroit River area for five years are summarized. Sulfur dioxide was measured by antometers. Hydrogen sulfide, chlorine, oxides of nitrogen, and ammonia were sampled. Suspended particulates were collected. The distribution of dust fall components is tabulated. About twenty metallic elements were identified by x-ray diffraction of suspended particulates. Community health surveys covering morbidity and mortality records and accounting for ethnic and socioeconomic factors are outlined.##

05008

New York State Air Pollution Control Board, Albany. (Feb. 1966.) 132 pp.

AIR POLLUTION/THE MID-HUDSON: GREENE, ULSTER, ROCKLAND, COLUMBIA,DUTCHESS (COMPREHENSIVE AREA SURVEY REPORT NUMBER SIX).

A comprehensive study of the air pollution potential in the Mid-Hudson area was undertaken as a cooperative effort by the Columbia, Dutchess, Rockland, and Ulster County Health Departments, and the State Health Department's Oneonta District Office (for Greene County) and Middletown District Office (for Beacon City). The objective of the study was to define the nature and extent, and causes and effects, of the air pollution potential in the Mid-Hudson area. Both industrial and nonindustrial air pollution were studied by conducting an inventory of possible air contaminant sources and determining contaminant emissions within each county. The inventory was supplemented by an atmospheric sampling network consisting of 41 stations located throughout the five counties.##

05009

New York State Air Pollution Control Board, Albany. June 1966. 35 pp.

AIR POLLUTION NASSAU COUNTY (COMPREHENSIVE AREA SURVEY REPORT NUMBER FOUR).

A comprehensive survey of local sources of atmospheric contamination was conducted by the Nassau County Department of Health in order to appraise the present status of and the potential for air pollution in the County. In defining the nature and extent of existing and potential air pollution, the objectives of this study were: (1) To provide information from which rules and regulations may be established for the control and abatement of existing air pollution in Nassau County; (2) To provide technical data needed to implement a practical and reasonable air pollution abatement program; (3) To assess the effectiveness of existing controls and determine what steps must be taken by governmental agencies to control both existing and potential air pollution; (4) To provide background data needed to check the effectiveness of any future control program; and (5) To obtain information for presentation to the State Air Pollution Control Board for use by the Board in establishing rules and regulations for control of air pollution as mandated by law. An inventory of air contaminant sources, an aerometric sampling network, and an investigation of complaints and air pollution effects were undertaken to obtain the date needed.##

05010

New York State Air Pollution Control Board, Albany. (July 1958.) 76 pp.

A REVIEW OF AIR POLLUTION IN NEW YORK STATE.

This report contains current knowledge of air pollution problems affecting New York State. Previous study results are summarized and more important factors influencing air pollution in the state are discussed. The nature and types of air contaminants , their effects, and the elements of air pollution legislation are considered. Study areas for future activities of the Air Pollution Control Board and priorities for action are proposed.#

05110

W. J. Hamming, R. D. MacPhee, and J. R. Taylor

CONTAMINANT CONCENTRATIONS IN THE ATMOSPHERE OF LOS ANGELES COUNTY . J. Air Pollution Control Assoc. 10, (1) 7-16, 93, Feb. 1960.

The primary purpose of this study was to analyze long-term pollution trends as measured by the Los Angeles air monitoring network. Except for work in England on a distinctly different type of air pollution problem, there are few data available which span any appreciable number of years. The District's monitoring was accomplished with 24-hr recording devices. Its usefulness is justified primarily as a protection and warning measure. A by-product of this operation is the generation of data from which pollution can be studied. The findings may be summarized as follows: (1) During the three-year period, 1956-59, the general level of CO rose. The rise in CO of one ppm per year was not reconciled with weather or other pollution factors. The rise in NO2 was small and trends are available only from 1957. SO2 varied slightly without changing its general level. Particulates declined during 1956 and 1957 which could have been due in part to the District's incinerator ban. A preliminary study on the basis of comparable weather factors appeared to justify this conclusion. The oxidant, eye irritant, and plant toxicant declined in 1956 and 1957 from a high in 1955, but exhibited a slight upturn in 1958. Winds and inversions appear to the determining factors for trends in eye irritant, oxidant and plant toxicant. (2) In examining the monthly average data used as the basis for the trend lines, it was observed that certain contaminant and weather factors could be grouped together. Monthly averages for primary, or Type I factors exhibited annual peaks in midwinter. These were CO, hydrocarbons, NO2, particulates, SO2 (not perfect fit), frequency of morning surface inversions, and the inverse of 1600-1900 PST windspeeds. In addition, the Type I contaminants are known to yield bimodal diurnal variations. Secondary, or Type II, entities showed annual peaks in the autumn, and single daily peaks. These included aldehydes, eye irritant, oxidant, plant toxicants, ozone alerts, restricted visibility, the frequency of Rule 57 Days, and the inverse of 24-hr average windspeeds. Both the yearly and the diurnal cycles confirm the distinction between Type I and Type II contaminants. (Author conclusions modified)##

05112

Rogers, L. H.

NITRIC OXIDE AND NITROGEN DIOXIDE IN THE LOS ANGELES ATMOSPHERE. J. Air Pollution Control Assoc. 8(2), 124-8, Aug. 1958. (Presented at the 132nd National Meeting, American Chemical Society, New York City, Sept. 8-13, 1957.)

The objective of the studies reported here was to identify the interrelationships between NO, NO2, OXIDANT AND OXIDANT precursor in the Los Angeles atmosphere. A four-channel instrument was used to monitor the atmosphere, except for the oxidant studies where a different instrument was used. The instrument included a 4-channel Brown strip chart recorder which made successive readings on a special 7-cell colorimeter. The colorimeter provided a means of measuring the reaction from 4 absorbing columns, one for each of the atmospheric components. NO2 was measured after contacting the air with modified Griess reagent; NO plus NO2 was measured by first converting NO to NO2 with a controlled concentration of ozone, and measuring the total NO2 with modified Griess reagent: oxidant was measured with 20% neutral KI; oxidant precursor was measured by first passing the air sample through a 50 l. Pyrex flask irradiated with four mercury arc lights, and then into a contacting column containing 20% neutral KI. Average oxidant precursor showed a greater value than oxidant both day and night, although the maximum was about the same for both components in the middle of the day. Oxidant precursor was distinctly greater during the hours when the sun's intensity diminished, and at night. A minimum was observed at 5 to 6 A. M. The average oxidant-forming power of the atmosphere, as measured by the oxidant precursor values, averaged more than 15 pphm. NO was found to occur at larger concentrations than NO_2 during the night, but a reversal occurred during the daylight hours. Moreover, there were two maxima for both components at about 8 A.M. and again about 6 to 10 P.M., with two minima: One in the middle of the day at about 11 A.M. to 2 P.M. and in the early morning at about 4 to 6 A.M. The minimum observed in the middle of the day occurred at the same time as the maximum oxidant value measured. The rough parallelism between No. and NO_2 concentrations at night suggests that NO_2 is being formed from NO, presumably by the reaction $2NO + O_2$ yields $2NO_2$.##

05336

C. E. Schumann and C. W. Gruber

AIR QUALITY DATA-1966. Cincinnati Dept. of Safety, Ohio, Div. of Air Pollution Control and Heating Inspection. (May 1967). 3j pp.

The purpose of this report, published for the first time as a separate document by the Cincinnati Division of Air Pollution Control, is to summarize air quality levels of pollutants currently being measured in the City of Cincinnati, including: (1) measurements made wholly by this Division; (2) results of cooperative projects with the U.S. Public Health Service; and (3) summaries of Cincinnati air quality compared to other cities for certain pollutants. Tabular data are given for: dust fall (setteable particulates); soiling index; suspended particulates; wind-blown particulates; gaseous pollutants; and Southwestern Ohio-Northern Kentucky air pollution survey.##

05481

AMBIENT AIR: GUILFORD COUNTY, NORTH CAROLINA. Guilford County Health Dept., Greenboro, N.C., Division of Environmental Health. 1966. 52 pp.

The purpose of this report was to provide factual information for the citizens and government of Guilford County for use in the development of a program to control air quality in the area. The County covers an area of 691 sq. miles and has a population of 246,520 (1960 census statistics). Industrial activities include: textile, wood products, machinery and metal products, food products, mineral products, printing and publishing, paint, chemical and fertilizer manufacturing. Pollutants resulting from these activities include: dusts, fines, fumes, smokes, organic vapors, odors, and gases. Sampling data for the year between 1964 and 1966 were obtained by the following methods: high volume samplers for suspended particles, dustfall jar sampling for dusts, AISI tapes for soiling index measurements, and gas samplers for SO2, NO and NO2. The sampling data are tabulated for the various pollutants. Estimated fuel usage in the County for the year of 1965 is tabulated. Estimated sulfur content for coal was 0.9% and 1.0% for commercial and domestic use, and industrial use, respectively. Meteorological aspects here pertaining to air pollution are also reported. Results indicated that an undesirable concentration of air pollution existed, based on levels established in other sections of the nation. More detailed and concentrated efforts are needed on gaseous sampling for achieving meaningful conclusions.##

05500

J. L. Sullivan

PARTICULATE AND GASEOUS POLLUTION IN NEW SOUTH WALES CITIES. Proc. Clean Air Conf., Univ. New South Wales, Vol. 1, 16p., 1962, Paper 1.

Measurements of smoke density, sulphur dioxide and oxidant levels have been made in New South Wales on a routine basis since 1958. Smoke densities were found to be high by the standards of American cities but low in comparison to Great Britain. During the months of winter the measured smoke density was above 4 coh units per thousand linear feet for approximately 1/3 to 1/2 of the total time and levels above 10 coh units per thousand linear feet occurred on most winter mornings. Sulphur dioxide varied from approximately 1 to 6 parts per hundred million and extreme levels reached only 10-12 parts per hundred million on the basis of 24 hour samples. The peak hourly concentration measured was 37.0 parts per hundred million, though higher readings were observed in the vicinity of specific sources. In one case a peak of 13.5 parts per million was recorded. Oxidant concentrations, measured by absorption in neutral potassium iodine, varied between the normal background of 0.02 ppm and 19 ppm. Higher concentrations of smoke were observed to occur during anti-cyclonic conditions when a moist maritime flow of air produced stable lapse rates over the coastal area. The extreme smoke density levels were associated with these conditions during the winter months and cold drainage currents from the Dividing Range. The meteorological factors associated with higher oxidant concentrations have not yet been established in Sydney. (Author abstract)##

05562

M. Tonomura

COOPERATION ON INSTRUMENTS AND MEASURING. Preprint. 1966.

Since January 1964, measurements have been made on the dust particles, CO, SO2 and nitrogen oxides, with a special emphasis on automobile exhaust gas, at several places of heavy traffic in Tokyo by means of automatic continuous measuring instruments. Measuring instruments for SO2, dust, CO, and nitrogen oxides employed an electro-conductivity system, a scattered light system, an IR adsorption system, and a spectrophotometer, respectively. These instruments were placed in a chamber having a blower alongside the road provided with an inlet of the air at the height of 2.5 meters on the boundary of human and vehicle traffics. Maximum, minimum and average of the concentrations of each substance by hour with traffic density for the years 1964 and 1965 are tabulated as well as the distribution of dust fall and SO2 concentrations for 22 Japanese cities in 1963. Graphic presentation of the Tokyo findings for the year 1965 are also presented. Generally speaking, the amount of traffic and CO showed a fairly good correlation up to 2,000 cars/hour. Nitrogen oxides as well as dust particles showed high concentrations in one area and are believed to be due to exhaust gas of vehicles. The low concentration of SO2 is considered as characteristic of a residential area.##

05573

L. B. Hitchcock, W. L. Faith, M. Neiburger, N. A. Renzetti, and L. H. Rogers

AIR POLLUTION SITUATION IN LOS ANGELES - AN AEROMETRIC SURVEY. Proc. Natl. Air Pollution Symp., 3rd, Pasadena, Calif., 1955. pp. 12-23.

This paper summarizes the methods, the results, and some preliminary indications and conclusions employed in the survey. A major purpose of the survey was to monitor presumably important variables so as to provide a more adequate basis for diagnosis of the general problem. Pinto beans were used to measure the plant damaging effects of smog. Also measured were oxidants, nitrogen dioxide, hydrocarbons, carbon monoxide, aldehydes, sulfur dioxide, particulates, and meteorological factors. Some of the recommendations derived from the survey are that more complete meteorological measurements be obtained, that plant damage as a measure of smog be given more extensive study, and that a minimum of 14 monitoring stations be established in the Los Angeles Basin.##

05627

W. E. Scott, E. R. Stephens, P. L. Hanst, and R. C. Doerr

FURTHER DEVELOPMENTS IN THE CHEMISTRY OF THE ATMOSPHERE. Preprint. (Presented at the Session on Air Pollution, 22nd Midyear Meeting, American Petroleum Inst., Division of Refining, Philadelphia, Pa., Mat 14, 1957.)

The technique of long-path IR spectroscopy is currently being used at the Franklin Institute both for direct studies of atmospheric pollution and for laboratory experiments. With the field instrument, concentrations of most of the important pollutants in the Los Angeles atmosphere were measured as a function of time and meteorological conditions. These studies supported the general picture of atmospheric pollutants and their reactions which was developed from laboratory studies both at The Franklin Institute and in other laboratories. Laboratory studies indicated the concentrations of NO and NO2 would be quite low in smog. The organic nitrogen compound, identified as perozyacyl nitrite, was a prominent product in the laboratory studies, and it was predicted that this compound would be found in the smog. Both of these conclusions were confirmed by atmospheric analysis. The presence of ozone, long used as the primary smog indicator, was also confirmed. Air analyses for several major pollutants, made after sundown, showed a close similarity to an analysis of diluted automobile exhaust and to an analysis of air taken near a heavy traffic center. Several compounds whose presence in polluted air has been suspected were found to be below the limit of detectability. Among these were H_2Co, HNO_3 and CH_3OH. Reaction products of O_3 with olefins at low concentration (30 ppm to 60 ppm) were identified as aldehydes, CO, CO_2, water, and, from propylene and 2-pentene, ketene. Other products of the reaction between O_3 and the higher olefins were indicated. Yield of CO and CO_2 indicated a definite connection between chain length and the decomposition of products. Several pure ozonides were prepared at low temperature, and their infrared spectra recorded. In some cases the decomposition products were determined.##

05652

Anderson, D. O., Williams, I. H., and Ferris, B. G., Jr.

THE CHILLIWACK RESPIRATORY SURVEY, 1963: PART II. AEROMETRIC STUDY. Can. Med. Assoc. J. 92, 954-61, May 1, 1965.

A study of the quality of the ambient air at Chilliwack, British Columbia, was conducted from May 1963 to April 1964. Measurements of dustfall, sulfation, hydrogen sulfide, oxidants and total hydrocarbons were made by a network of five sampling stations. The results of this survey indicated that Chilliwack was relatively free from any air pollution and would therefore be a suitable control for a study of the relationship between community air pollution and respiratory disease.

06150

H. Sakabe, R. Soda, Y. Matsumura, K. Honma, and K. Nozaki

AIR POLLUTION STUDY AT HEAVY TRAFFIC ROAD. (Bull. Natl. Inst. Indust. Health, (Kawaskai, Japan)) (4) 72-6, 1960. Jap.

A report is given of the hourly measurements of air pollutants between 8 A.M. and 7 P.M. on March 3 and 4, 1960 at a heavy traffic circle in Tokyo. The meteorological conditions were: temperature 5 to 15 deg. C, humidity 38 to 78%, and wind velocity 1 to 4 m/sec. The pollutants measured and methods of measurement are as follows: CO (Kitagawa-type tester), SO_2 (Thomas' Method), HCHO (Sodium Hydrogen Sulfite and Chromatropic Acid Sodium Salt Method), and NO and NO_2 (Okasa-Toda Method). The results are tabulated and graphs of the hourly variation are given. The average findings were CO, 2.5 to 20.0 ppm; SO_2, 0.02 to 0.097 ppm; HCHO, 0.035 to 0.2 ppm; and NO plus NO_2, 0.008 to 0.032 ppm. The highest concentrations were found between 8 and 10 A.M. and between 6 and 7 P.M.##

06290

Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control

WASHINGTON, D. C., METROPOLITAN AREA AIR POLLUTION ABATEMENT ACTIVITY. ((212))p., Nov. 1967. 18 refs.

From February 1967 to August 1967 the Public Health Service conducted a technical investigation in the Washington, D.C., metropolitan area to provide information that could form a basis for recommendations for abatement in accordance with the tenets of the Clean Air Act. The results are presented of the 1967 investigation and the methods, techniques, and procedures are described. In concert with cooperative regional and local agencies, an air quality network was established, an emissions inventory was conducted, extensive meteorological data were acquired, air pollution effects on vegetation and various materials were investigated, and special data processing and summarization techniques were developed. The boundaries for the activity conformed to the Metropolitan Washington Council of Governments' area which includes the District of Columbia; the Maryland counties of Montgomery and Prince Georges; the Virginia counties of Arlington, Fairfax, Loudoun, and Prince William; and the independent cities of Alexandria, Falls Church, and Fairfax.##

06700

NATIONAL AIR SURVEILLANCE NETWORKS - FIRST QUARTER TABULATION 1967. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control. (1967). 217 pp.

The data obtained by the National Air Sampling Network (NASN) during the first quarter of 1967 are presented. The tabulations are arranged in alphabetical order by state and include data on suspended particulate, SO2 and NO2.##

06701

NATIONAL AIR SURVEILLANCE NETWORKS CONTINUOUS AIR MONITORING PROGRAM (1966 DATA TABULATIONS AND SUMMARIES FOR CHICAGO, CINCINNATI, DENVER, PHILADELPHIA, ST. LOUIS, AND WASHINGTON, D.C.). Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control. (1966). 551 pp.

The Continuous Air Monitoring Program is the National Air Surveillance Network which operates six continuous monitoring stations in major cities throughout the country. The data tabulations in this booklet are summaries of hourly concentrations of gaseous pollutants and 2-hourly summaries of soiling index levels during 1966. Also enclosed is a brief summary of monthly means and maxima, and annual frequency distributions of data from all stations.##

06707

SUMMARY OF 1964-1965 AIR QUALITY MEASUREMENTS. 90th Congress ("Air Pollution--1967, Part 3 (Air Quality Act") Senate Committee on Public Works, Washington, D.C., Subcommittee on Air and Water Pollution, April 19, May 2-4, 8-10, 1967.) p. 129801306.

Air pollution surveillance activities conducted by the National Center for Air Pollution Control include a nationwide network of stations equipped for periodic measurement of suspended particulate matter and, in some instances, such gaseous pollutants as sulfur dioxide and nitrogen dioxide; a six-city network of stations equipped for continuous measurement of several gaseous pollutants; and a relatively new network of stations designed to provide a general indication of effects of air pollution on various types of materials in interstate regions. Data from both the periodic and continuous air sampling stations are discussed.##

06760

N. Saruta

AIR POLLUTION IN NORTHERN KYUSHU. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo) 4, (2) 35-45, July8 1966. Jap.

A preliminary investigation of air pollution in northern Kyushu was started in 1952 and studies on existing conditions have been carried out since 1959. The yearly and monthly amounts of dust fall and SO2 in the five wards of northern Kyushu are tabulated for 1959 through 1965. The results show decrease in dust fall (from 26.49 to 20.73 tons/sq. cm./month) and in increase in SO2 (from 0.25 to 0.64 mg/100 cc/day). Tabulations of dust fall and SO2 are given for the industrial, business, and residential sections. The Fe2C3 present in red smoke has also been measured and averages between 2.0 and 2.8g/sq. m/month. Measurements of 3,4-benzopyrene and components of automobile exhaust such as CO, SO2, Pb, NO, and NO2 are also tabulated for the five wards.##

06872

K. L. Shesterikova P. N. Strogal'shchikova

ATMOSPHERIC POLLUTION BY NITROGEN OXIDES. (Zagryaznenie atmosfernogo vozdukha okislami azota.) Hyg. Sanit. (Gigiena i Sanit.) 30 (5), 232-3 (May 1965). Russ. (Tr.)

Determinations of nitrogen oxides concentration over the streets in Chelyabinsk, Russia, during peak traffic hours were compiled. In 51% of the samples, nitrogen oxides exceed the maximum permissible concentration (0.3 mg/cu m). The lowest concentrations of nitrogen oxides are found at two points, where the traffic density is lower and the broad streets are situated on an elevation, therefore in a well ventilated position.##

06788

(STUDIES OF AIR POLLUTION IN THE DEPARTMENT OF THE SEINE IN 1965. PART 3. CONDITIONS AT ORLY AIRPORT.) Etudes de Pollution Atmospherique dans le Departement de la Seine en 1965. Troisieme Partie. Operation "Aerodrome d'Orly." Laboratoire Municipal de la Prefecture de Police, Paris, France. (Apr. 1966.) pp. 1-2, 9, 11, 13-7. Fr.

The results of an air pollution study made at Orly Airport at the request of the medical services at the airport are given. The survey covered the exposure to ground personnel and an investigation of the components of the fuel and emissions from jets. The investigation was conducted by a mobile air pollution laboratory located at the field during the study. In general, the pollution was neglible, the emissions from the jets were not a matter of concern, but there was a nuisance hazard to workers on piston planes. The carbon monoxide was determined by infra-red absorption with an average reading recorded every 15 min. The averages ranged from 0.5 to 18 ppm. The other contaminants that were determined included carbon dioxide, nitric oxide, nitrogen dioxide, sulfur dioxide, aldehydes, lead, 3,4-benzopyrene, toluene, xylene, and benzene, and in all cases the results were much lower than those obtained in various stations in Paris. Both on the basis of analyses made on ambient air and on emissions from jets there is little evidence of air pollution at Orly Airport in Paris.##

06960

R. W. Dahle, Jr.

ANNUAL REPORT OF THE BUREAU OF INDUSTRIAL HYGIENE, 1966. Baltimore City Health Dept., Md., Bureau of Industrial Hygiene. (1966). 15 pp.

Some results of industrial hygiene investigations are cited. The atmospheric monitoring program is discussed and the results of sampling for oxidants, aldehydes, nitrogen dioxide, and dust fall are graphed. Complaints involving air pollution are tabulated.##

06966

J. E. Yocom, J. A. Farrow, J. C. Magyar, and R. M. Gagosz

AIR POLLUTION STUDY OF NEW BRITAIN, CONNECTICUT (SUMMARY REPORT). ((TRC Service Corp., Hartford, Conn.)) (Sept. 1966). 38 pp.

The City of New Britain Health Department conducted a survey of air pollution in the city. It was the purpose of the survey to develop information on the major sources of air pollution in the city and determine their geographical distribution, to collect data on the general level of air quality in terms of several pollutants, and to measure meteorological conditions associated with the air quality measurements. The survey was started in October 1965 and was completed in July 1966. Air sampling and meteorological measurements were made concurrently over approximately a one month period in each of the 4 deasons. Between the winter and spring sampling periods several samples for suspended particulate matter were collected in the vicinity of suspected major sources of particulate matter. The source inventory was conducted throughout the entire survey period. The survey was designed to enable the Health Department to assess the need for an air pollution control program and to serve as the basis for developing such a program.##

06977

AIR RESOURCES IN THE MID-WILLAMETTE VALLEY. Mid-Willamette Valley Air Pollution Authority, Salem, Oreg. (Dec. 1966). 80 pp.

In October of 1965, a survey and sampling program was initiated to determine the quality of air within the five counties of Benton, Linn, Marion, Polk and Yamhill. Phase I of this survey was accomplished by location of major sources of air pollution, identification of amounts and kinds of pollutants and, with meteorological data, establishment of dispersal and disposition patterns of pollution. Sources of pollution in the Mid-Willamette Valley consist mainly of combustion of fuels for heat and power, process emissions, and industrial and community solid waste disposal practive. Other sources of lesser significance at this time include auto exhaust emissions and agriculture and forest management practices. Intermittent build up of suspended particulates occurs during inversion periods throughout the year. Any month of the year in Salem will see inversions two of every three mornings. In conclusion, the early findings in the study do not indicate the need for a crash program of air pollution control. There is a strong indication that unless a preventive program is initiated to cope with the expansion and growth of communities and industries, the quality of the air supply will rapidly deteriorate.##

07166

K. Horiuchi

A STUDY ON THE STATUS QUO OF AIR POLLUTION IN JAPAN. Osaka City Med. J. (Japan) 10(1):181-200 (1964). (Presented at the Expert Committee on Air Pollution, World Health Organization, Geneva, Switzerland, Oct. 15-21, 1963.)

The major sources of air pollution in Japan and the important pollutants, are discussed and tabulated. Results of epidemiological surveys are described including morbidity and mortality data. Regulations of the Japan Public Health Association are listed and items covered are: maximum allowable concentrations; emission standards; and analytical, sampling, and measurement methods.##

07198

Y. Kawanami

AIR POLLUTION IN TOKYO. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo) 4(2):11-22 (July 1966). Jap.

A definition of smog is given as the restriction of visibility to less than 2 km in the city and vicinity, excluding the restriction by rain. Out of 154 days when smog occurred in Tokyo in 1965, 64 were caused by heavy fumes and 90 by mist or haze. The differences in times of occurrence of heavy fume-type smog and mist or haze-type smog is discussed. The yearly variation of the number of "smog days" is graphed indicating seasonal influences. Smog decreases in winter but increases in summer and fall. The current status of air pollution in Tokyo is also covered with respect to dust and soot fall, floating dust, sulfuric acid, nitrogen oxides, hydrocarbons, and lead compounds. Measurement of dust and soot fall in Tokyo began in 1955 and yearly variations are graphed through 1965. Dust fall reaches a peak between February and May and then again in August and September. These peaks are related to the meteorological influence of strong winds in spring and large amounts of rain in spring and late summer. Therefore, July and December are considered the best times to investigate air pollution without meteorological influence. Lengthy discussion is given to daily and hourly variations of pollution peaks in urban, industrial, and suburban areas.##

07371

Hayashi, S.

THE PRESENT SITUATION OF COUNTER MEASURES FOR PUBLIC NUISANCE IN JAPAN. Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc.,) (Tokyo), 1(1):8-12, 1964.

General information on public nuisance in connection with the rapid development of industry in Japan is given. As for the present status of air pollution, the amount of dust fall, SO2, and automobile exhaust are investigated. Dust fall and SO3 measured at 296 places is tabulated where the maximum dust fall is 137 tons/sq. km. per month (in northern Kyushu) and the minimum is 2 tons/sq. km. per month, and for SO3 the maximum is 2.7 mg/100 sq. cm. per day. In 1962, the maximum SO2 value of 0.23 ppm/hr was recorded and a concentration of 0.1 ppm/hr lasted for 19 hours in Tokyo. As for automobile exhaust, an instant CO value of 10 to 20 ppm has been recorded very often and a maximum of NO2 was found between 0.02 to 0.05 ppm. A "public nuisance prevention" law has been established mainly for the three largest industrial areas, but some prefectures will not enforce it.##

07448

C. P. Robison, J. C. Chambers, J. W. Bates

DEFINING THE PROBLEM OF AIR POLLUTION IN METROPOLITAN BIRMINGHAM, ALABAMA. Preprint, Jefferson County Dept. of Health, Ala., ((32)) p., June 1967. 15 refs.

The air pollution problem in Metropolitan Birmingham, Alabama is presented. The results and recommendations of previous and current studies of air pollution in Jefferson County are compiled. Possible methods of air pollution control are also discussed. The topography of the Birmingham area is irregular, consisting of ridges with intervening valleys. The city proper is in a valley. The main climatic effect of the topography is that during winter months it produces extreme temperature inversions and rather low minimum temperatures. The range of annual averages of suspended particulate matter in the 10 station sampling network varied from 72 to 281 microgram/cu. m. Results show that 20% of the time suspended particulate matter in Jefferson County exceeds 265 microgram/cu. m. The annual averages for dustfall range from 9.5 tons/sq. mi./mo to 87.8 tons/sq mi./mo. Sulfation levels are generally rather low in Jefferson County. Sulfur dioxide levels are generally low year round with the winter season having the highest concentrations. Nitrogen dioxide was the only gaseous pollutant found in any significant quantities with the range of daily levels being 0.7 to 62.7 parts per hundred million. Daily aldehyde lebels ranged from 0 to 4.0 parts per hundred million. Air pollution comes from four main sources: (1) Domestic, (2) Transportation, (3) Commercial, and (4) Industrial. Stationary sources include the domestic, commercial and industrial. Industrial sources account for approximately 98% of the particulate emissions, 88% of the gaseous emissions and 53% of the hydrocarbon emissions from stationary sources. In comparison with stationary sources transportation contributes only slightly to the particulate matter. The results of the public opinion survey showed that 54% of the people within the City of Birmingham and an average of 42% of the people outside the city limits were annoyed or affected adversely in some way by air pollution.**

07478

Dmitriev, M. T. and O. I. Yurasova

CONTENT OF THE PRODUCTS OF THE RADIOLYSIS OF AIR IN THE WORKING CHAMBERS OF A POWERFUL GAMMA UNIT. ((K voprosu o soderzhanii produktov radioliza vozdukha v rabochikh kamerakh moshchmykh gamma-ustanovok.)) Hyg. Sanit. (English Translation of: Gigiena i Sanit.), 32(3):442-447, March 1967. 10 refs.
CFSTI: TT 67-51409/1

The degree of formation of ozone and nitrogen oxides in the air of the working chamber of a powerful gamma-unit was investigated. The ozone was determined from the decomposition of potassium iodide, while the nitrogen oxides were determined by Griess's reaction as modified by Gorodetskii (1960). The nitrogen oxides were determined at the worksite in the respiratory zone of the operator at a distance of 1.5 - 3m from the irradiator, 1 min after its immersion in water and the entry of people into the working chamber. With an air change factor of 10 vol/min, the plenum-exhaust ventilation of the working chamber of the gamma-unit reduces the concentration of nitrogen oxide at the worksites to 0.04 - 0.9 mg/cu. m., which is 1/5 - 1/100 of the maximum permissible concentration. Considerable concentrations of ozone were found in the space between the irradiator planes at the moment of irradiation. With an irradiation time of 20 min and dose rates of 300 to 600 rad/sec, the concentrations were 0.21 to

1.92 mg/cu. m., when the plenum-exhaust ventilation was turned off. When it was working, the concentration of ozone decreased to 0.34 - 0.84 mg/cu. m., which is still above the maximum permissible concentration for industrial premises. In cases where it is necessary to exclude the harmful effects of ozone on the irradiated material, the ventilation calculations should take into account the high concentration of ozone near the irradiator.##

07529

S. Hayashi

PUBLIC NUISANCE PROBLEM AND ITS COUNTERMEASURE IN YOKKAICHI CITY. Text in Japanese. Kuki Seijo (Clean Air, J. Japan. Air Cleaning Assoc., Tokyo) Japan Air Cleaning Assoc. (Tokyo), 2(3):1-18, 1965.

In a study of the environmental conditions of Yokkaichi City, it was found that the amount of soot and dust fall has been decreasing, but SO2 and SO3 concentration are increasing. The main section of the Yokkaichi industrial area is made up of two large industries containing a power station using only heavy oil. One of the problems to be considered is the poor city planning which does not take into account existing meteorological conditions. Investigations were made on soot and dust fall, sulfur oxides, H2S, NO2, NO3, and Cl. Methods of sampling, places sampled, and duration of tests are tabulated. The British standard deposit gage was used for dust fall, the high-volume air sampler for floating dusts, and the PbO2 method for SO2 measurement. The maximum quantity of dust fall measured between December 1962 and October 1963 was 40.99 tons/sq. km month. The yearly variation is graphed showing the inclination toward decrease. The highest average value of SO2 determined was 2 mg/day. The range of value is wide in Yokkaichi city. The ratio of SO2 : SO3 was shown to be more than 1:1. Medical investigations were also performed on 30,000 people. The quantity of dust and soot fall and SO2 is tabulated for 20 places with the corresponding occurrences of colds, bronchitis, emphysema, heart disease, eye disease, and allergic dermatitis. The relation betwwen SO2 concentration and the occurrence of throat disease, colds, emphysema, and bronchitis for children up to 4 years of age and for people over 50 is graphed indicating a notable relation.##

07549

N. Yamate

AIR POLLUTION BY TOXIC GAS AND ITS COUNTER MEASURE. Text in Japanese. Kuki Seijo (Clean Air, J. Japan Air Cleaning Assoc., Tokyo) 3(2):19-25, 1965. 5 refs.

The present status of air pollution in Japan and its counter measures are described according to the chemical composition of the pollutlants: sulfur oxides, nitrogen oxides, halogen compounds, organic compounds, and solid particles (dusts). The hourly variation of SO2 concentration is graphed. In Tokyo, there is a peak around noon of about 15 pphm; NO2 ranges from 1 to 1.5 pphm with little variation. Concentrations of

SO2, NO, NO2, H2S, and CO were measured in Yokkaichi, Osaka and Ube as well as in Tokyo. Graphs relating amount of traffic to CO concentration show almost the same pattern. Concentrations of HCl and HF in the air are quite small (0.35 ppm and 0.3-0.4 micrograms/cu m., respectively) near chemical plants producing these gases. Counter measures used against the various pollutant emissions are: the dry method, wet method, activated carbon method for sulfur oxides; alkali or oxidation method for nitrogen oxide; dry iron oxide and dry absorption methods for H2S; and water washing method for HCl and HF. Afterburner methods by sparking and heat concentration are described for control of automobile exhausts. However, problems encountered with the afterburner methods are the high temperature required and nitrogen oxide increase. The equipment required is also rather large. Another method employing catalysts is described in which loam, molybdenum, white gold, nickel or vanadium are used effectively.##

07712

Braverman, M. M.

TRENDS AND LEVELS OF AIR POLLUTION IN NEW YORK CITY. Am. Ind. Hyg. Ass/c. J. 28 (3):291-293, May-June 1967. 6 refs.

The Bureau of Laboratories of the Department of Air Pollution Control of New York City has maintained a comprehensive monitoring program of significant parameters of air pollution for over ten years. Trends and levels of concentrations of gases and particulates over this period are presented. Comparisons of the concentrations of gaseous pollutants with their threshold limit values (TLV) present a novel perspective of their significance. Gaseous pollutants that emanate chiefly from motor vehicles for which adequate control devices were not in use, continued to show a slight upward trend. Particulates continue to show a slight downward trend. Evidence is presented which demonstrates that more significant values may be achieved when absolute concentrations of gaseous pollutants are compared with their respective threshold level values.##

08067

Alkire, G. J. and C. R. Wyss

AIR QUALITY SURVEY AT SELECTED SITES ON THE HANFORD PROJECT. Battelle-Northwest, Richland, Wash., Pacific Northwest Lab., Contract AT(45-1)-1830, 16p., Nov. 1967. 9 refs.
CFSTI: BNWL-564

The concentration of five potentially significant air pollutants (SO2, NO, NO2, HCHO, and H2S) was measured at selected sites on the Hanford Project during the period May 17, 1967, through July 14, 1967. The observed concentration of these gases was below the detection limit most of the time, but significant levels of nitrogen oxides and sulfur dioxide were observed at some sites part of the time. Downwind of a chemical separations plant, nitrogen oxides (NO + NO2) were above detection limits (0.01 ppm) about 30% of the time. Peak NO + NO+2 CONCENTRATIONS ranged to 0.36 ppm, and hourly averages ranged to 0.12 ppm.

Average sulfur dioxide concentrations were less than or equal to background 96% of the time at two sites, and 89% of the time at a third site. Aldehydes and hydrogen sulfide were not detected above background during the survey. (Authors' abstract)##

08297

Spinazzola, A., L. Marraccini, G. Devoto, and S. Zedda

DISTRIBUTION OF SEVERAL VOLATILE TOXIC PRODUCTS WHICH ARE INDICATORS OF AIR POLLUTION IN THE CITY OF CAGLIARI. NOTE I. NITROGEN DIOXIDE. ((Studio sul comportamento di alcuni prodotti tossici volatili quale indice di inquinamento atmosferico nella citta' di Cagliari. Nota I. Gli ossidi azoto.)) Text in Italian. Folia Med. (Naples), 49(8):569-579, Aug. 1966. 19 refs.

Measurements of the level of nitrogen dioxide were made at 18 locations from 8 A.M. to 8 P.M., from Dec. 1, 1965 to July 15, 1966. Selective samplers were placed 150 and 200 cm above street level at each monitoring location and sampled 60 l/hr of air. NO2 was present at levels ranging from 0.0018 to 0.0470 ppm. The highest level is seen at street corners with traffic lights (0.0470 and 0.0316 ppm) and in areas with congested traffic (0.0330-0.0200 ppm). Areas with light traffic did not exceed 0.0090 ppm. Levels generally reach a peak during rush hours. The results are compared with those from other studies in Naples, Milan, and Bologna. It is concluded that the probable source of NO2 is the combustion of diesel oil or gasoline.

08300

Maga, John A. and Asce, M.

VEHICULAR POLLUTION EFFECTS IN URBAN DEVELOPMENT. Proc.Am. Soc. Civil Engrs., J. Urban Planning Develop. Div., 93(UP4): 231-241, Dec. 1967. (Presented at the American Society of Civil Engineers Transportation Engineering Conference, Philadelphia, Pa., Oct. 17-21, 1966.)

Toxic emissions from motor vehicles such as carbon monoxide, hydrocarbons, and nitrogen oxides in urban areas were measured. The tabulated results indicate that operation of large numbers of motor vehicles cause high concentrations of these contaminants in the urban atmosphere. The direct relationship between emissions and atmospheric concentrations is found in localized situations as well as communitywide air pollution. The quantity of exhaust contamination emitted can be related to traffic patterns and vehicle operating modes. Stop and go driving results in more pollutants than unimpeded flow. The present approach to a reduction of motor vehicle emissions, which is based mainly on engine modification and the use of control devices, is not sufficient. Additional benefits can be obtained through highway design, mass transit, and urban planning.

08301

Bush, Albert F., Asce, M. and Nottage, H. B.

CARBON DIOXIDE AS AN INDICATOR OF AIR POLLUTION. Proc. Am. Soc. Civil Engrs., J. Sanit. Eng. Div., 93(SA6):211-253, Dec. 1967.

Carbon dioxide as an indicator of chemical air quality, its relationship to other indices of air pollution, and its characteristics in an urban atmosphere were investigated. Infrared CO2 analyzers were installed at the Continuous Air Monitoring Program (CAMP) stations in San Francisco and Los Angeles. Data were obtained also from San Diego. Sufficient continuous data were obtained from March 1964 to Feb. 1965 from the Los Angeles analyzer to allow a comparative analysis of CO2 with other indicators measured by CAMP--CO, NO, NO2, Ox and SO2. Since all the data were obtained at the West Coast, SO2 concentrations did not reach sufficient intensity to be significant. The chemical and meteorological relationships of the above pollutants were also determined. Data from a mobile CO2 unit are presented as they relate to a freeway study, a residential heating study, and an ocean study. The results show that carbon dioxide is a good indicator of chemical air quality in the urban atmosphere. In absoute magnitude it indicates the levels of the other indices of air pollution. Seasonal norms of each variable are reflected in corresponding seasonal norms for CO2, and daily exposure patterns as well as diurnal patterns indicate approximate levels of other indices. The gross meteorological pattern of the atmosphere is also reflected in the daily build-up of CO2. Recommendations include a different layout for freeway construction to reduce air pollution, more rugged, simpler and fully automotive instruments for measuring CO2, and continuous measurement of atmospheric CO2 at Weather Bureau stations throughout the United States.

08327

Robison, Charles B., Frederick L. Meadows, and John J. Henderson

ALABAMA RESPIRATORY DISEASE AND AIR POLLUTION STUDY. II. AIR POLLUTION PATTERNS IN THE GREATER BIRMINGHAM AREA. Arch. Environ. Health, Vol. 15, p. 703-727, Dec. 1967. 22 refs.

In 1962, the Alabama Respiratory Disease and Air Pollution Study was initiated to determine the prevalence of various pulmonary disorders and to relate these findings to air quality data. This paper describes part of the aerometric effort begun in December 1963 in the Greater Birmingham Area. Samples for analysis of suspended particulate, dustfall, sulfation, and 24-hour gases (nitrogen dioxide, sulfur dioxide, and aldehydes) were collected routinely from 21 stations located primarily in residential areas. Annual cumulative frequency distributions for suspended particulate, dustfall, sulfation, nitrogen dioxide, and sulfur dioxide displayed a log-normal distribution. Aliphatic aldehydes were found to be normally distributed. Suspended particulate and dustfall levels were extremely high in certain locations throughout the area. The annual mean for suspended particulates from this network was 125 microgram/cu m, which is considerably higher than the national urban mean. Seasonal means at several stations often exceeded 200 microgram/cu m. The annual mean for dustfall was 22 tons/sq. mi/mo, which is higher than the annual mean reported in either Nashville or St. Louis. This annual mean reflects the influence of seven stations in very clean areas, which consistently reported seasonal means less than 15 tons/sq. mi/mo. Sulfation and sulfur dioxide levels showed similar seasonal patterns. For the entire network, both of these pollutants were found in relatively low concentrations. The annual mean for sulfation was 0.16 SO_3/100 sq. cm/day, and for sulfur dioxide, 0.2 pphm. The nitrogen dioxide annual mean for the 21 stations was 7.1 pphm, which is higher than levels found in most NASN cities. Seasonal means for nitrogen dioxide varied less than those for other gaseous pollutants. The annual mean for aliphatic aldehyde was 1.4 pphm. Aldehyde sampling has been done on a very limited basis in the United States and consequently no data are available to compare with these 24-hour concentrations. (Authors' summary)##

08438

Berdyev, Kh. B., Pavlovich, N. V., and Tuzhilina, A. A.

EFFECT OF MOTOR VEHICLE EXHAUST GASES ON ATMOSPHERIC POLLUTION IN DWELLINGS AND IN A MAIN STREET.
((Vliyanie vybrosov avtotransporta na zagryaznenie vozdukha zhilykh pomeshchenii i ulichnoi magistrali.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.) 32(4-6):424-426, April-June 1967. 1 ref.
CFSTI: TT 67-51409/2

Considerable concentrations of carbon monoxide, nitrogen oxides, lead compounds and dust were measured in the atmosphere of the main street and in the living premises, exceeding the maximum permissible concentrations. The 50 percent increase in the density of vehicular traffic in 1963 in comparison to 1961 (from 780 to 1,200 vehicles per hour) increased only the carbon monoxide concentration in the street air (by 50 percent), all other indices remaining at the previous level. A comparison of the concentrations of health hazards at different levels revealed the highest concentration of carbon monoxide in the living rooms of the third story and those of dust and lead in the first story. The concentrations of nitrogen oxides were the same in the street, in the first and the third stories.

09018

Hess, W.

SUMMARY OF THE ATMOSPHERIC STUDIES IN THE CITY OF ZURICH BETWEEN 1961 AND 1965. Z. Praeventivmed. (Zurich), 11(2):144-156, 1966. 5 refs. Translated from German. Joint Publications Research Service, Washington, D. C., R-8942-D, 14p., Jan. 12, 1968.

Measurements of CO, SO_2, and NO_x concentrations were made at several important intersections of heavy traffic. Carboxyhemoglobin concentrations were measured in the blood of traffic officers and were correlated with CO measurements. The concentrations of the various pollutants fluctuated within a wide range and depended on the density of traffic and meteorological conditions.##

09117

Alvisatos, G. P., B. N. Bazas, J. Alexopoulos, and E. Verykokakis

AIR POLLUTION IN THE CITY OF ATHENS AND SURROUNDING TERRITORY. L'Igiene Moderan, 60(1-2):3-25, Jan.-Feb. 1967. 42 refs.

Air pollution in Athens is discussed with emphasis on emission sources, population density, and city planning. An air sampling survey, conducted from mid-1962 to the early part of 1966, is described. The survey concentrated mainly on determining the amounts of smoke, SO2, CO, dust particles, dustfall, and polycyclic aromatic hydrocarbons. The results are tabulated. It is concluded that no immediate health hazard exists from air pollution in Athens because it is a windy and dry area. Recommendations are made to avoid hazardous air pollution in the future.##

09209

Schuenemann, J. J.

ASSIGNMENT REPORT. AIR POLLUTION TEHERAN. AN INTRODUCTORY SURVEY OF THE PROBLEMS AND SOME SUGGESTED ACTIVITIES. World Health Organization, Geneva (Switzerland), 49p., Sept. 13-Oct. 1, 1965. 3 refs.

A project was begun in the city of Teheran which consisted of these two parts: 1. A short term study of the main recognized sources of air pollution in the city with the aim of identifying their causes and recommending appropriate technical and administrative measures for their abatement. 2. A long-term small scale study of air pollutants and their effects on the community with the aim of training staff and developing techniques for more intensive future studies. Information corresponding to these two parts is presented.##

09445

Comprehensive Planning Bureau, Japan, Osaka Municipal Office

AIR OVER OSAKA CITY. 93P., 1967

The location, geographical features, population, manufacturing, and administration of Osaka City are discussed. An extensive discussion of the measurement of air pollution is presented. The sampling networks and measurement of dustfall, sulfur dioxide, suspended particulate matter, automobile exhaust gases, and meteorological parameters are discussed in detail. A survey of air pollution sources in Osaka City is summarized.##

09743

Roberts, D. P.

SHORT TERM COMMUNITY AIR POLLUTION STUDIES IN TENNESSEE. Occupational Health Rev. (Ottawa), 19(1-2):11-15, 1967. 3 refs.

Short-term studies of air pollution in eight Tennessee towns selected on the basis of geographic location and population - less than 40,000 people are described. The studies indicated that at least some of the towns had significant levels of particulate air pollution as measured by weight of such particulates and by soiling potential of the particles. It was also found that the gaseous pollutants measured were of no immediate concern in towns of this size. (Author's abstract, modified)##

11224

Venezia, R. and G. Ozolins

INTERSTATE AIR POLLUTION STUDY PHASE II PROJECT REPORT. II. AIR POLLUTANT EMISSION INVENTORY. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 50p., Dec. 1966. ((50)) refs.

An emission inventory was conducted during 1963-1964 as part of the St. Louis - East St. Louis Interstate Air Pollution Study. The Study covered an area of 3,567 square miles and included the City of St. Louis and the six surrounding counties - St. Louis, St. Charles, and Jefferson Counties in Missouri and Madison, St. Clair, and Monroe Counties in Illinois. More than 95 percent of the population and almost all of the industrial activity are located in the 400 square miles of the centrally located urbanized part of the Study area. The pollutant emission data presented can be almost entirely attributed to this urbanized portion of the area. Population density and land-use maps, which provide an excellent index to the areal distribution of most pollutant emissions, are presented. The pollutants considered in this survey are those emitted in large quantities from a variety and multitude of sources dispersed throughout the area. Included are aldehydes, carbon monoxide, hydrocarbons, nitrogen oxides (calculated as nitrogen dioxide), sulfur oxides (calculated as sulfur dioxide), particulates, and benzo(a)pyrene. The emissions of other pollutants are generally associated with a specific process or operation and in general, are not distributed throughout the community. (Authors' abstract, modified)##

11267

Public Health Service, Cincinnati, Ohio, Div. of Air Pollution.

FOUR-YEAR SUMMARY OF DATA FROM THE CONTINUOUS AIR MONITORING PROGRAM.
Preprint, ((23))p., Aug. 1966.

Continuous air monitoring data gathered during 1962 - 1965 is summarized. Ambient atmospheric concentrations of siz gaseous air pollutants from several major american cities are given. These include sulfur dioxide, nitric oxide, nitrogen dioxide, total oxidants, total hydrocarbons, and carbon monozide, and sailing index values. Summaries by city and year are given of the annual average concentrations, the maximum and minimum monthly average concentrations, and the maximum daily average concentration of the several pollutants monitored.##

13964

Detrie, J. P.

METEOROLOGICAL CONDITIONS AND ATMOSPHERIC POLLUTION IN THE PARIS AREA. (Conditions meteorologiques et pollution atmospherique dans la region parisienne). Text in French. Meteorologie, no.2: 273-293, April-June 1967.

The evolution of sulfur dioxide in Paris and its environs is being determined by daily measurements made by the Laboratory of Hygiene. This sulfur dioxide is almost entirely the product of combustible solids and liquids; the amount of pollution due to motor oils and gases is small and consists of nitrogen oxides. Where chimneys open at rooftop level, the velocity of exit gas temperatures is not an important factor in the dispersion of emissions. Dispersion due to vertical drop in temperature and the albedo (reflective power) of the city is important, ensuring good atmospheric diffusion of pollutants even when winds are weak. Calm periods, with an inversion of temperature, hinder dispersion of emissions and cause an important increase in contamination. Strong winds reduce the concentration of contaminated air. .The maximum number of pollutants appear in winds from the northeast or southeast. Winds from the west carry few pollutants. The strongest pollution corresponds to the anticyclone barometric pressures. Rain reduces pollution but coincides with winds from the west. Beginning with arrondissements with 3,000 occupants per sq km, a good correlation exists between population density and pollution. Below this figure, pollution is independent of population density.

14180

Gordon, Robert J., Henry Mayrsohn, and Raymond M. Ingels

C2-C5 HYDROCARBONS IN THE LOS ANGELES ATMOSPHERE. Environ. Sci. Technol., 2(12):1117-1120, Dec. 1968. 12 refs.

A joint study was carried out in Los Angeles in the fall of 1967 to define more closely the actual concentration of oxides of nitrogen and various hydrocarbons in the atmosphere on days of differing smog intensity. Part of the study involved gas chromatographic analysis for light hydrocarbons, ethane to isopentane, at two sites. Almost 700 samples were run during 46 days. Averages were presented for the hourly samples subdivided into groups of high or low oxidant development. Light paraffins, especially propane, were found in concentrations too high to be ascribed to auto exhaust, but their source was not pinpointed. The average morning concentration of oxidant at various locations was closely similar, hour by hour, in spite of large differences in the levels of primary pollutants. The ratios of acetylene and high olefins to nitrogen oxides were found to be higher than the average in exhaust generated in a test cycle on a dynamometer.

14534

COMMISSION ON EARTH, WATER AND AIR, ROTTERDAM. Annual Report 1968. (Verslag over het jaar 1968). Text in Dutch. 72p.

This report deals with the soil, water, and air pollution problems in the vicinity of Rotterdam. Thirty-three cases of soil pollution reported in 1968 were mainly due to leakage in underground tanks and pipes. The average chlorine content at low tides at the measuring station of the Horingerdijk reservoir was 139 mg/l, 7 mg/l lower than in 1967. The level of air pollution during 1968 was more or less constant in comparison with 1967. A study of the 1218 bronchitis complaints of male civil servants indicated that bronchitis occurs with increasing frequency in the age group above 40 and especially above 60. A study of chronic bronchitis and asthma in elementary school children in two sections of Rotterdam indicated that in Crosswijk, 5.5% of 455 children had chronic bronchitis and 2.2% had asthma. In Hillegersberg, 1.0% of 480 children had chronic bronchitis and 1.7% had asthma. Measurements of precipitation, smoke, polycyclic hydrocarbons, CO, ozone, NO2, and sulfur oxides are presented. The smoke meter results show a usual smoke content of 100 micrograms/cu m or more during long periods of mist which occur during the winter months. In the first and fourth quarters, the polycyclic hydrocarbon values were much smaller than those of 1964. Of 174 samples of carbon monoxide, 18 were more than 30 ppm; in 1967, only one sample was higher than 30 ppm. The highest lead content was 1.5 micrograms/cu m. Ozone content of the air was less than 20 micrograms/cu m on cloudy days. Nitrogen oxide concentration ranged from 100-150 micrograms/cu m. Ninety-one days were recorded with SO2 content equal to or greater than 350 micrograms/cu m, and 89 days were recorded with smoke content equal to or greater than 250 micrograms/cu m. The declining tendency for smoke pollution was attributed to the increasing use of natural gas.

14776

Lahmann, Erdwin

STUDIES OF AIR POLLUTION CAUSED BY MOTOR VEHICLES. (Untersuchungen ueber Luftverunreinigungen durch den Kraftverkehr). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 28, 80p., 1969. 123 refs.

A measuring station for determining the extent of air pollution caused by motor vehicles was erected in front of the city hall in West Berlin, considered to be the busiest point in the city. The Uras infrared analyzer was used for continuous measurement of CO and CO2 concentrations 75 cm above the ground; ozone was continuously measured at 2 and 20 m with a unit developed by Damaschke und Luebke based on liberation of bromine from a potassium bromide solution by ozone. For continuous measurement of hydrocarbons at 75 cm, a Beckman 109A analyzer was used. Discontinuous sampling was employed for measurement of NO, SO2, formaldehyde, and phenols. A high volume sampler was used for determination of the total dust concentration. Traffic counts were conducted throughout the measurement period, and the driving cycles were determined. The results are listed in detail in numerous tables and diagrams. The influence of meteorological factors such as wind direction and speed, humidity, temperature, and pressure is discussed. The maximum half-hourly average CO concentration was 60 ppm with concentration peaks in the morning and afternoon rush hours. Maximum CO2 concentration was somewhat less than 500 ppm and thus only 50% higher than the natural CO2 concentration of the atmosphere. No dangerous ozone concentrations were measured. All NO2 concentrations were below 0.2 mg/cu m. Peak SO2 concentrations occurred in between rush hours, which indicates that they are due to domestic heaters. A linear relationship between the various pollutants was found. The results of these measurements are compared with results in the literature.

14785

Franco, P. and C. De Pompeis

INQUIRY INTO ATMOSPHERIC POLLUTION IN THE CITY OF PESCARA. (Indagine sull'inquinamento atmosferico nella citta' di Pescara). Text in Italian. Igiene Sanita Publica (Rome), 24(11-12):550-567, Nov.-Dec. 1968. 29 refs.

This Italian city of 120,000 inhabitants and 20,703 motor vehicles has light to medium industry, relies heavily on tourist trade from surrounding resorts, is the fastest-growing city outside Rome, and is intersected (rather than by-passed) by the Adriatic national highway. Homes are heated, mostly with heavy naphtha, from early November to late March. Fifty percent of approximately 1000 home heating plants lack official approval. No central facility for burning trash is provided. In May 1967 and April-June 1968, the air was tested at 15 critical points with Draeger 19/31 gas detectors, located 1-1.70 m above street level, for the presence of CO, CO2, SO2, hydrocarbons, and the nitrogen oxides, from 8:30 to 12 a.m. and 7-8 p.m. Carbon monoxide was detected at six points; at one point, where crosstown and Adriatic highway traffic meet, the concentration was 100 ppm. Sulfur dioxide was detected at two points. Practical proposals were made: better placement of bus stops, timed traffic lights, installation of air purifiers, possibility of more electrically driven public transport, education of motorists in 'anti-pollution' driving habits, and use of larger zones of vegetation in congested areas. The authors feel that confinement of Pescara's expansion to the seacoast has been salutary and they oppose future expansion into the hilly inland region, because such expansion would promote more severe air pollution problems.

14930

Nakano, Michio

AIR MONITORING NETWORKS IN THE CITY, ITS SITUATION AND PROBLEMS (II). (Toshi taikiosen monitaringu netto waku. Sono genjo to mondaiten (II)). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 5(6):29-33, June 1969. 6 refs.

Eleven stations in Osaka city and six stations in Sakai city were established to collect air pollution data in a composite network system. Placement areas were chosen based on population density in the compact industrialized sections. Each station measures sulfur oxide gas by conductivity and floating dusts by digital meter, as well as wind direction and velocity. These data are sent to the central station every twenty minutes. With these facilities and equipment, industrial pollution is monitored by computer. Receiving offices in factories record and respond to the same data, taking prompt action in the case of hazardous pollution levels. In addition, mobile observation cars travel around the cities recording nitrogen oxide and carbon monoxide levels. Similar air monitoring networks are being developed in other cities.

14997

Hilst, Glenn R., John E. Yocom, and Norman E. Bowne

THE DEVELOPMENT OF A SIMULATION MODEL FOR AIR POLLUTION OVER CONNECTICUT. VOLUME 1. (SUMMARY REPORT.). Travelers Research Center, Inc., Hartford, Conn., Grant RSA-67-4, 66p., Oct. 1967. 3 refs.
CFSTI, DDC: PB 182 608

A working, computer-oriented simulation model of the state-wide Connecticut air pollution system was developed. This simulation model is designed to estimate the cumulative air pollution loading of Connecticut's atmosphere with a spatial resolution of one mile and a time resolution of one hour. Any arbitrary distribution of the air pollution sources can be evaluated with regard to resultant air quality over the region. As a management tool for evaluation of alternative air pollution control practices, this model provides an unprecedented information and evaluation system. In addition to the construction of this very versatile simulation model, an inventory of the location and hour-by-hour emission rates of the varied sources of five pollutants was completed, the major variabilities of the atmospheric dispersion processes over Connecticut were assessed. These products serve as the input variables to the simulation model. The source inventories show that, in 1967, man-made sources of air pollution in Connecticut will emit some 300,000 tons of oxides of sulfur, 129,000 tons of the oxides of nitrogen, 1,290,000 tons of carbon monoxide, 328,600 tons of hydrocarbons, and 63,900 tons of suspended particulates. Exemplary calculations of the expected air pollution levels in Connecticut under various meteorological conditions, as predicted by the simulation model, are presented. These examples show clearly the regional variability of air quality; they illustrate the power of the model to evaluate of complex planning and control problems inherent in effective air resource management. Connecticut will have the advantage of a system that can evaluate the air quality implications of control plans before they are implemented and also define, in unprecedented detail, the causes of present and future air pollution problems. (Author summary modified)

15005

Weatherley, M.-L. P. M.

AIR POLLUTION MEASUREMENTS AT ISLINGTON, LONDON, IN 1964. PART II. GASEOUS POLLUTANTS SAMPLED INTERMITTENTLY: NITROGEN OXIDES, CARBON MONOXIDE, AMMONIA, AND SULFUR DIOXIDE MEASURED BY THE THORIN METHOD. Preprint, Warren Spring Lab., Stevenage, U. K., Atmospheric Pollution Div., LR 40(AP), 19p., Aug. 1966. 10 refs.

Concentrations of carbon monoxide, nitrogen oxides, and gaseous ammonia measured intermittently at Islington, London in 1964 were analysed for the frequency distribution of concentrations and correlations between pollutants. Estimates of sulfur dioxide from measurement of total sulfate and of net acidity, corrected for ammonia, are compared. Attention is drawn to the fact that the NO/NO2 ratio rises with NO concentration at levels normally found at Islington and that the rate of increase appears to decrease as smog levels are reached. The ratio is correlated with NO rather than NO2. It is suggested that low concentrations of nitric oxide are completely oxidized by ozone and that the proportion of NO oxidized decreases as the concentration rises and the ozone is used. The higher correlation between nitrogen oxides and sulfur dioxide compared with that of smoke suggests that nitrogen oxides at Islington arise mainly from nondomestic combustion. The presence of ammonia was not a major source of error in sulfur dioxide determination by the peroxide method, suggesting that the method is adequate for sulfur dioxide surveys. The borate net acidity method of measurement usually gave slightly higher concentrations than the thorin total sulfate method, suggesting that the borate method may be taking account of acid or acid-producing gases in the air not measured by the thorin method. On a few occasions the net acidity method gave very much lower concentrations than the thorin method, even after correction for ammonia. Differences between the two methods are more or less independent of concentration. (Author conclusions modified)

15161

Yamate, Noboru

SUMMARY OF AIR POLLUTANTS LEVELS IN THREE AIR MONITORING STATIONS IN TOKYO, 1968. (Tokyotonai 3 chiten no taikiosen sokuteimo sokutei kekka no gaiyo). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 7(3):45-61, Oct. 1969.

Outlines of numerous figures, charts, and indices obtained by the air monitoring stations at three locations in Tokyo from January to December of 1968 are reported. The purpose of these monitoring activities was to determine exact and accurate pollutant levels in conjunction with traffic situations at the three monitoring station points. Measurements were made of seven pollutants using an automatic recorder. The tested pollutants were SO2, carbon monoxide, NO, NO2, dusts, formaldehyde, and total oxides; traffic situation was recorded simultaneously. The average values measured were classified into hourly, daily, monthly, and yearly rates, and each maximum and minimum rate was reported. The relationship between traffic status and pollutant levels was obtained by the regression expression method. The quantities of CO, SO2, and HCHO showed the existence of a relationship, but NO2 and atmospheric dust did not show a particular relationship. The interrelationship between each pollutant level is reported and summarized. The general tendency of the pollutant levels determined for the past five years showed that both carbon monoxide and atmospheric dust were increasing, while nitrogen oxides remained almost the same and SO2 decreased.

15173

Tonomura, Masaharu, Nobuo Yamate, and Kusuo Tsuji

OBSERVATIONS OF AIR POLLUTION WITH THE AID OF AUTOMATIC CONTINUOUS ANALYSERS. II. RELATIONSHIP AMONG THE CONCENTRATIONS OF VARIOUS

KINDS OF POLLUTANTS IN ATMOSPHERE. (Renzoku sokutei kirokukei ni yoru taiki osen no kenkyu (dai 2 ho) Taikichu ni okeru osenbutsu kan no sokan kankei ni tsuite). Text in Japanese. Eisei Shikensho Hokoku (Bull. Natl. Inst. Hyg. Sci., Tokyo), no. 85:35-40, 1967. 4 refs.

In a study conducted from January through December in 1964, air pollution in Tokyo was determined. The relationships between the concentrations of various kinds of pollutants, such as CO, SO2, NO, NO2, and dust particles, were determined as a function of their concentrations in the air. The pollutants were collected in three heavy traffic areas in Tokyo: Kasumigaseki, Itabashi, and Shinjuku. A previous survey indicated that a relationship might exist among the atmospheric contaminants originating from automotive exhaust gases. To evaluate this possibility, correlation coefficients between the concentrations of CO-SO2 and CO-NO were calculated using data from the automatic and continuous analyzers. The correlation coefficients revealed that a nearly perfect linear relationship exists between both sets of contaminants. For CO-NO2 and SO2-NO2, no significant relationships could be obtained. It was concluded that formulas could be used to estimate the concentrations of some pollutants, primarily those originating from automotive exhaust gases. (Author abstract modified)

15610

Odaira, Toshio

AIR POLLUTION FROM MOTOR VEHICLE GASES IN TOKYO AND OSAKA. (Dai toshi ni okeru jidosha haiki gas ni yoru taiki osen no jittai). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 5(5):337-353, 1969. 17 refs.

Various pollutant concentrations were determined near highways and surrounding areas in Tokyo and Osaka. A large amount of carbon monoxide was found near the highways, and gradually decreased in the surrounding areas. The difference in the height of the pollutant between the highway and surrounding areas could not be measured to 100 m if the wind was slow and natural convections occurred. The carbon monoxide concentration was found to be related to traffic density. The four pollutant patterns differed from each other in the dust content, sulfur dioxide and nitrogen dioxide content, carbon monoxide and nitric oxide content, and ozone content. The average CO was 3 to 8 ppm/yr; however, 40 to 50 ppm/hr was not rare. In the middle of the city, over 10 ppm/hr was measured 27% of the time. In the districts that were 100 to 200 yards from the highway, the monthly average was 5 to 6 ppm, but 30 to 50 ppm/hr sometimes occurred. In winter, this became serious. Nitric oxide concentrations were 0.05 to 0.25 ppm along the highway; NO2 was estimated to be less than 0.05 ppm. For the surrounding districts, NO was 0.05 to 0.15 ppm in winter and 0.01 to 0.05 ppm in summer. Hydrocarbons averaged 2 ppm/mo along the highway. Carbon monoxide, NO, and the hydrocarbon concentration curve changed during the day. Oxidants averaged 0.02 to 0.06 ppm/mo and sometimes 0.14 to 0.25 ppm/hr. These measurements reveal that photochemical smog is important in Tokyo. Lead was 3 to 9 mg/cu m along the highway and 0.7 to 5 mg/cu m in the surrounding districts.

LEGAL AND ADMINISTRATIVE

00169

A. J. Benline

1965 ANNUAL REPORT - DEPARTMENT OF AIR POLLUTION CONTROL - CITY OF NEW YORK. Dept. of Air Pollution Control News 8, (5) Apr. 1966. 40 pp.

City of New York, Department of Air Pollution Control, Annual Report for 1965, describes New York City air pollution progress as it relates to administration and personnel; engineering; public opinion; types of pollution; means and methods to curtail air pollution.##

00311

AIR POLLUTION (A SURVEY OF EXISTING LEGISLATION). Intern. Digest Health Legislation 14, 187-229, 1963.

This report contains a comparative survey of existing legislation for the control of atmospheric pollution, and discusses specific laws and regulations of following countries: Australia, Belgium, Canada, Chile, Czechoslovakia, France, Federal Republic of Germany, Ireland, Jamaica, New Zealand, Poland, England and the United States.##

00336

G. Ozolins and R. Smith

A RAPID SURVEY TECHNIQUE FOR ESTIMATING COMMUNITY AIR POLLUTION EMISSIONS. Public Health Service, Cincinnati, Ohio, Division of Air Pollution. Oct. 1966. 83 pp. (Presented at the 59th Annual Meeting of the Air Pollution Control Assoc., San Francisco, Calif., June 20-24, 1966, Paper No. 66-11.)

A technique has been developed for surveying pollutant emissions within a community or metropolitan area in 3 to 6 man-weeks. The methods for conducting such a survey are described in this paper. An important feature of this technique is the concept of reporting zones. The quantities of pollutants released can be assessed not only for the total community but also for different subdivisions of the area. The results are emission maps of a community depicting emission of pollutants in quantities per unit area. Seasonal variations in pollutant concentrations are considered, and emission rates of pollutants can be calculated for specified times of the year. The four major source categories considered are combustion of fuels in stationary and in mobile sources, combustion of refuse material, and industrial process losses. Each category is considered in detail relative to sources of information, seasonal variation in emissions, methods for estimating pollutant emissions by areas, and use of emission factors. Results obtained by application of this technique in two metropolitan areas are summarized. (Author)##

00897

M.P. Malbos

(THE STRUGGLE AGAINST AIR POLLUTION IN NEW YORK. REGULATIONS AND OBSERVATIONS ON THEIR APPLICATIONS.) La Lutte Contre La Pollution de l'Air a New York. Reglementation et Observations sur l'Application. Pollut Atmos. (Paris) 8(29):34-47, Jan.-Mar. 1966.

Two leaflets which were punlished and which concern the general methods to be used in New York's fight against air pollution are summarized. The first leaflet, published on October 1, 1964, gives the "New Code" for the control of air pollution, which includes the control methods, standards to be met for discharges, the rules for installing and maintaining machinery and appliances, and the standards of fuels to be used. The second leaflet, June 22, 1965, is the technical report of the Special Enquiry committee on Air Pollution, and gives the results of the measures put into effect against the different polluting agents in New York, the evaluation of discharges from different sources, and the role of the various municipal administrations set up for the control and surveillance of the work. (Author summary)##

01604

R.A. Venezia

THE INTERSTATE AIR POLLUTION STUDY: ST. LOUIS - EAST ST. LOUIS METROPOLITAN AREA. Public Health Service, Cincinnati, Ohio, Div. of Air Pollution. (Presented at Missouri Public Health Association Convention, Kansas City, May 11, 1965.) 1965. 22 pp.

The Interstate Air Pollution Study of the St. Louis - East St. Louis metropolitan area is described. The study was in keeping with the air resource management concept. Dustfall, suspended particulates, soiling index, sulfur dioxide, oxidants, odors, carbon monoxide, hydrocarbons, nitrogen oxide, nitrogen dioxide, sulfur dioxide, ozone, and visibility were measured. The effects indicated by steel corrosion, nylon and cotton deterioration, asthma, opinion surveys, and complaints were examined. An emission inventory, meteorology, fluorescent tracer diffusion, diffusion models, economic losses, legal aspects, and public relations were studied during the study.##

02055

E. P. Grant and W. E. Nissen.

CALIFORNIA'S PROGRAM FOR MOTOR VEHICLE EMISSION CONTROL.

Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper VI/19). pp. 210-2.

The paper gives a general account of the extent of air pollution in the State of California and the measures taken so far to control it. It proceeds to deal in greater detail with the investigations undertaken by the motor industry, especially by the Motor Vehicle Pollution Control Board and the various devices that have proved to be effective in keeping the objectionable emissions under control. (Author abstract)##

02376

AIR RESOURCE MANAGEMENT PROGRAM SOUTHWESTERN OHIO-NORTHERN KENTUCKY. Preprint. Published as report: Air Resource Management Program for Southwestern Ohio-Northern Kentucky, Mar. 1967, 51 pp. SWO - NK (Southwestern Ohio - Northern Kentucky) Air Pollution Survey, Cincinnati, Ohio, SWO - NK Technical Committee. 1966.

The primary purpose of this report is to assist the citizens and governments of southwestern Ohio and norther Kentucky in understanding the nature of their air pollution problem and in developing a course of action - an air resource management program - to assure desirable air quality both now and in the future. This report is the culmination of over a year of study and effort under the title, Southwestern Ohio - Northern Kentucky (SWO-NK) Air Pollution Survey. The survey, established by formal agreement on March 31, 1965, brought together governmental officials, interested citizens, and industrial leaders from both sides of the Ohio River to consider a problem common to them all and to propose a solution, of necessity, common to them all. This report also presents a general discussion of the air pollution problem and applies to it the ideal methodology for solving the problem, the air resource management concept. Various aspects of the air pollution problem in the project area are summarized from Technical Committee reports to provide background for the program proposal. The current status of control is also covered.#
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03353

DIGEST OF MUNICIPAL AIR POLLUTION ORDINANCES. Pittsburgh Univ., Pa., Law Center. (PHS Publication No. 982.) 1962. 520 pp.

Regulations, ordinances and their administration regarding allowable concentration for air pollutants are presented. Enforcement procedures, inspection procedures, and penalties for violation of specific regulations are presented for urban areas. Air pollution control starts with the premise that no one has the right to use the atmosphere as a receptor of wastes in a manner which will adversely affect the health, comfort or property of others.##

03359

AIR POLLUTION IN NEW YORK CITY (INTERIM TECHNICAL REPT. M-970). New York City Council, Special Committee to

Investigate Air Pollution. June 22, 1965. 74 pp.

Authors cover the following topics of air pollution as they relate to New York City: (1) air quality - a statistical analysis, (2) The effects of air pollution on health as well as agricultural and plant life, (3) The major sources of air pollution in New York City, covering categories such as fuel combustion in stationary sources, vehicular exhaust, refuse combustion, industrial processes, and emission calculation, (4) The influence of weather, (5) and analysis of air pollution control program.##

03554

REGULATION 3. Bay Area Air Pollution Control District, San Francisco, Calif. Jan. 4, 1967. 44 pp.

This Regulation applies to emission of reactive organic gases from source operations defined and to the registration of each person responsible for organic gas emissions, for which limits are established by this Regulation. Analytical procedures prescribed are intended to facilitate the determination of concentrations or quantities of the various kinds of air contaminants defined in this Regulation. Any procedure which provides for such determination with accuracy equal to or greater than the prescribed procedure shall be acceptable, provided that the burden of demonstrating such accuracy shall rest upon the person proposing the procedure.##

03944

MOTOR VEHICLE POLLUTION IN CALIFORNIA (A STATUS REPORT). California State Dept. of Public Health, Berkeley, Bureau of Air Sanitation. Jan. 1967. 11 pp.

A review of all the factors involved indicates that there is no simple and inexpensive solution to the complex problem of motor vehicle created air pollution. The problem has many aspects. It is legal, political, social, economical and technological. The final solution must incorporate considerations for all these aspects. The motor vehicle control program in California has reduced emissions of hydrocarbons and carbon monoxide into the atmosphere. In spite of the increasing number of vehicles, there has been a reversal in emission trends for the first time. If the goal of prewar air quality is to be achieved, there must be a high degree of emission control. Consequently, the program requires that effective systems be available, and that virtually no cars be exempt. Lack of efficient control of some emissions, large numbers of cars uncontrolled, and deterioration in efficiency of control system will lead to air quality poorer than that desired. Under the present program, which is oriented towards the installation of control systems on new cars, the reduction of contaminants emanating from motor vehicles will be gradual. In order to accomplish a rapid improvement, within a few years, exhaust emissions from all cars (new and used) must be controlled. Even if events follow the predictions growth of motor vehicle usage beyond 1980 leads again to a rising trend. Curtailment time. Motor vehicle registration is increasing at a rapid pace; control programs are usually less effective than planned; there is a long time delay between the establishment of standards and the development of exhaust and evaporative control devices. For these reasons, and because of the poor prospect of exhaust control for used cars, it is important to consider far more stringent motor vehicle emission standards than those already adopted. (Author conclusion)##

05571

F. N. Frenkiel

AIR POLLUTION IN THE GROWING COMMUNITY. Proc. Symp. Cleaner Air Urban Areas, Philadelphia, Pa. pp. 1-15 (1956).

Like any living being, a living community breathes. Its automobiles, railroads, home heaters, rubbish disposals, industry, power plants....all inhale air and exhale polluted air into the atmosphere. Here, Dr. Frenkiel discusses methods for studying the relative contributions of various pollution sources to a community's pollution problem, the increase of pollution in a growing community, and the effectiveness of certain methods for reducing pollution. He explains how a mathematical treatment can clarify the interplay among the many features of a community that contribute to its general air pollution problem - the location and density of pollution sources, meteorological conditions, community geography, and control measures. The main object of these mathematical studies, he points out, is to determine the probable patterns that pollution will take, and the contribution of each source to the pollutant concentration at any given location. He cites a study of this sort made using as an example of Los Angeles County. This mathematical treatment, or "model", then helps determine what measures must be taken when atmospheric pollution threatens to reach emergency levels, how effective various pollution control plans might be, what effect a new source might have on the pattern of concentration, forecasts of patterns that would result from contemplated urban expansion, and the effect of urban planning on predicated pollution levels.##

05598

AIR AND WATER POLLUTION. Ohio Legislative Service Commission, Columbus, Ohio. (Staff Research Rept. 84.) (Feb. 1967). 87 pp.

This study deals separately with air and water pollution problems. Chapters five, six, seven, and eight are concerned with air pollution. They consider the nature and effects of air pollution, the extent to which it is a problem in Ohio, the programs and efforts being made to reduce the problem in Ohio, some problems in existing programs, and finally some suggested approaches for improving control of Ohio air pollution. The chapters dealing with water pollution are treated in essentially the same way. The sources of air pollution are pointed out as motor vehicle exhausts, industrial emission, and power generation as major sources and refuse disposal and space heating as minor sources. The effects that are caused by pollutants are varied but generally they affect human health, comfort, and welfare. In Ohio, a highly industrialized and urbanized state, the potential for serious air pollution problems is great, but an absence of uniform and complete data on all known air pollutants in the state precludes an accurage state-wide assessment. It, of course, reflects the national trend in terms of pollutants. However, air pollution in a particular area has not yet been evaluated. It is known that the levels of some pollutants are declining, but data on some major gases are not available. Ohio is currently using five basic functions in their air pollution control program: abatement, prevention, monitoring, research and planning. Federal, state, local and intergovernmental levels are all being used to attack the problem. The Report of the Committee to Study Air and Water Pollution is included, and it stresses the need for more stringent regulations to enforce present and future statutes, especially at the local level.##

06188

Larsen, Ralph I.

DETERMINING REDUCED-EMISSION GOALS NEEDED TO ACHIEVE AIR QUALITY GOALS--A HYPOTHETICAL CASE. J. Air Pollution Control Assoc., 17(12):823-829, Dec. 1967. 37 refs. Presented at the Annual Meeting, Air Pollution Control Assoc., Cleveland, Ohio, June 11-16, 1967.)

Air management steps involved in determining reduced-emission goals include determining the effects of various pollutant concentrations on man, animals, plants, and property; deciding which effects to prevent; selecting ambient air quality goals that will prevent these effects; measuring and evaluating pollutant concentrations from sources and in the ambient atmosphere; calculating overall source reductions needed to achieve selected ambient air quality goals; and finally, determining reduced-emission goals for the various source types. Examples are cited of the various decisions and actions involved in determining a set of reduced-emission goals for stationary and mobile combustion sources.

06734

COMMONWEALTH OF PENNSYLVANIA, DEPARTMENT OF HEALTH, AIR POLLUTION COMMISSION, AMBIENT AIR QUALITY CRITERIA. 90th Congress "Air Pollution--1967, Part IV (Air Quality Act)" Senate Committee on Public Works, Washington, D.C., Subcommittee on Air and Water Pollution, May 15-18, 1967.) p. 2396-7.

Ambient air quality criteria are tabulated as set forth in section 5 (f) (8) of the Pennsylvania Air Pollution Control Act of January 8, 1960, P.L. 2119. These criteria were adopted on April 25, 1967 by the Air Pollution Commission. Included in the tabulation are: particulates, lead, beryllium, fluorides, sulfur dioxide, carbon monoxide, and others. References are provided for the sampling and analytical methods employed for each pollutant.##

06754

(EXCERPTS FROM THE ANNUAL REPORT FOR 1964 OF THE STATE INSTITUTE FOR THE PRESERVATION OF CLEAN AIR AND AGRICULTURAL LAND.) Aus dem Jahresbericht 1964 der Landesanstalt fur Immissions- und Bodennutzungsschutz. Reinhaltung der Luft im Land Nordrheim-Westfalen (3) 39-48, 1965. Ger.

A survey was made of the activities of an agency of the State of North Rhine-Westfalia concerned with air pollution problems. Air pollution control programs are described, in particular the first, second, and third program for measuring SO2 and dust concentrations. Instrumentation for measuring SO2, F, H2S, NO2, and NH3 is mentioned. Some practical results of reducing the emission in various industrial plants are presented, mostly of the metal and coal-using industries. Extensive experiments have been made to determine harmful effects of air pollutants on plants. A list of plants ordered according to their susceptibility is given.##

07072

M. E. McLouth and J. P. Terry

AIR POLLUTION CONTROL AT CAPE KENNEDY. ((Am. Ind. Hyg. Assoc. J.)) 26 (2), 172-6 (Apr. 1965). (Presented at the American Industrial Hygiene Conference, Philadelphia, Pa., Apr. 26-30, 1964.)

Larger missiles and the increased use of toxic propellants require effective planning and operations to prevent the development of major air pollution problems. At Cape Kennedy Air Force Station, large-scale air-borne sources are of an instantaneous rather than a continuous nature. Significant air contamination sources include missile exhaust, aborts, spills of volatile propellants, disposal of toxic materials, and normal industrial or transportation activities. Abatement techniques incorporating equipment design, operations support, and environmental studies are discussed. Special emphasis is given controls, test data, and problems associated with the Titan II missile program. (Authors' abstract)##

07519

Chass, Robert L., Michael Pratch, and Arthur A. Atkisson

THE AIR POLLUTION DISASTER--PREVENTION PROGRAM OF LOS ANGELES COUNTY. J. Air Pollution Control Assoc., 8(1):72-81, May 1958. (Presented at the 50th Annual Meeting, Air Pollution Control Assoc., St. Louis, Mo., June 2-6, 1957.)

The objectives of the L.A. disaster prevention program are as follows: (1) To identify the specific contaminants present in smog which are capable of inducing health disturbances. (2) To establish concentration standards for these contaminants which provide a safe margin in the event of adverse meteorological conditions which would tend to concentrate their dosage in the Los Angeles Basin and to prevent their rapid dispersion and evacuation from populated areas. (3) To establish means of measuring continuously the presence of these critical contaminants in the Los Angeles atmosphere. (4) To establish emergency methods which may be implemented in the event measured concentrations approach the standards established as potentially harmful to the public. The approach used to attain each of these objectives is described.##

07550

Philadelphia Dept. of Public Health, Pa.

AIR POLLUTION FROM FUEL COMBUSTION PROCESSES IN PHILADELPHIA. Preprint, 8p., Sept. 1966.

The combustion of fuels is the greatest single source of air pollutant emissions within a metropolitan area. As much as 80% of the total weight of pollutants discharged to the atmosphere result from the burning of fuels for electrical power generation, for industrial and commercial heat and power, for domestic heating, an for vehicular power. The purpose of this report is to summarize the present status of the problem in Philadelphia and to recommend necessary regulations and other action required to deal with the problem.##

07597

Heller, A.

MAXIMUM PERMISSIBLE CONCENTRATIONS FOR AIR POLLUTION IN THE FEDERAL REPUBLIC OF GERMANY. Preprint, Federal Inst. of Hygiene for Water, Soil and Air, Berlin, Germany, 10p., 1963. (Presented at the Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement, Geneva, Switzerland, Aug. 6-12, 1963, Paper No. WHO/AP/8.)

An advisory committee set up by the Federal Government gives expert advice on the proposals of the Clean Air Commission of the Association of German Engineers regarding permissible emissions as well as on the maximum concentrations of "immissions" - the MIK values - for various air pollutants. The task of the Verein Deutscher Ingenieure Commission is to set scientific and technical bases for appropriate air pollution control measures The main task of the Commission is to draft recommendations for new technical regulations as a basis for the determination and control of air pollution, as follows: Minimum requirements regarding the concentration and precipitation of dusts and gases in the atmosphere, bases for calculating the distribution of dusts and gases and for determining the required height of chimneys, limits to the emission of dust and gas from sources of air pollution, and procedures for measuring dusts and gases. The provisions recommended for examining applications for licences to establish new plants or to alter existing plants are reviewed. Enforcement of these regulations will depend on the local situation, especially the existing pollution load. They will als depend on the extent to which further pollution could occur, without exceeding the tolerance limit or the MIK-value for the most sensitive among the reaction partners, whether human being, animal or plant, and on the technical processes of the industrial plant in question. In principle, all reasonable technical and economic possibilites for purifying waste gases should be exploited in equal fashin by similar industrial plants. Finally, industry should be prepared to bear more far-reaching demands regarding waste-gas removal, if a licence for a new industrial plant or for the extension of an existing plant is to be issued in an area already polluted. MIK-values have been set and are discussed for; sulfur dioxide, hydrogen sulfide, some nitrous gase and chlorine.##

07877

Downing, George

A REPORT ON AIR POLLUTION AND AIR POLLUTION CONTROL IN CLEVELAND. Preprint, 1956 Union Commerce Building, Cleveland, Ohio, ((76)) p., Sept. 21, 1967. 44 refs.

The contents are: (1) a brief survey of the national air pollution crisis; (2) a survey of the air pollution crisis in Cleveland; (3) statistics on the Cleveland pollution problem and how they are obtained; (4) the major sources of air pollution in Cleveland, effectiveness of present measures for their control, recommendations for future control; and general observations. A report of the National Center for Air Pollution Control on Relative Severity of Air Pollution in the 65 standard metropolitan statistical areas, August, 1967; Table on air pollution in 302 U. S. Cities prepared by the Division of Air Pollution of the Public Health Service, 1966; and Little Hoover Commission Report on Division of Air Pollution Control of the City of Cleveland, January, 1967 are appended.

08194

Kalyuzhnyi, D. N., Y. I. Kostoveskii, S. A. Davydov, and M. B. Aksel'rod

EFFECTIVENESS OF SANITARY CLEARANCE ZONES BETWEEN INDUSTRIAL ENTERPRISES AND RESIDENTIAL QUARTERS. Gigiena i Sanit., No. 4:9-12, 1952. Translated from Russian by B. S. Levine, U. S. S. R. Literature on Air Pollution and Related Occupational Diseases, Vol. 3, p. 179-183, Aug. 1960.
CFSTI: T TT 60-21913

Results of atmospheric air studies in the vicinity of chemical and metallurgical plants demonstrated that dust, sulfur dioxide, hydrogen sulfide and nitric oxide were absorbed from polluted air by suitable types of plant life to a considerable degree. It is recommended that in creating intervening sanitary clearance zones provisions should be made for planting suitable trees and other types of plant life. AS##

08463

Ross, Laurence W.

SIZING UP ANTI-POLLUTION LEGISLATION. Chem. Eng., 74(15):191-196, July 17, 1967. 18 refs.

At instigation of Federal Government, states are working rapidly toward effective standards for regulating quality of water and air. Standards for water will depend primarily on authoritative technical opinion and will vary according to local conditions. Standards for air quality will come increasingly under direction of Federal Government and will tend to be more uniform from locality to locality. Air control, state laws and regulations, municipal laws and regulations and the pattern for the future are air pollution topics discussed. Other topics dealing with water pollution are discussed.##

09053

Copeland, John O.

AIR POLLUTION. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 9p., 1967. (Remarks made at a meeting of the Illinois Society of Professional Engineers, Edwardsville, Ill., Oct. 20, 1967.)

In a talk based on information from other U. S. Public Health Service publications, the air pollution problem is described as one of emissions, effects, regulation, and control touching the technical, social, political and economic aspects of our society. U. S. Public Health Service 1966 estimates of 142 million tons of pollutant emissions per annum are reported by type and source with predictions for rapid increases unless air pollution is controlled in the near future. Air quality criteria are stressed as necessary guidelines for control. Authority for control is described as lying with many jurisdictions with the trend being toward centralization to cover every locality within the United States. The Federal role in air pollution is discussed. The need for the skill and knowledge of the professional engineer in the air pollution field is described as unlimited.##

09121

Department of Health, Education, and Welfare, Washington, D. C.

AIR POLLUTION BY FEDERAL FACILITIES. (A REPORT TO THE UNITED STATES CONGRESS IN COMPLIANCE WITH PUBLIC LAW 90-148 THE CLEAN AIR ACT, AS AMENDED.) Preprint, ((41))p., Jan. 1968.

The present status of the program for the control of air pollution from Federal installations is discussed. The National Center for Air Pollution Control has established a Federal Facilities Section which will devote full time to the surveillance of air pollution problems arising from Federal activities, the extension of technical assistance to other agencies and departments, and to studies of the scheduling of the necessary improvements in control of the emissions at Federal establishments. The Secretary of DHEW has established limits on the emission of sulfur oxides to the atmosphere from Federal facilities in Standard Metropolitan Statistical Areas or Standard Consolidated Areas which have a population exceeding 2 million and a population density exceeding 15,000 persons per square mile. (Presently New York, Chicago, and Philadelphia). Information received indicates that all agencies intend to comply with the regulations as rapidly as possible. The General Services Administration and the Department of Defense have begun studies of problems associated with fuel supply nationally and with specific emphasis on New York, Philadelphia and Chicago. The Department of Defense has initiated a program of testing fuel oil for its sulfur content. Potential beryllium emissions from rockets have been controlled by DOD and National Aeronautics and Space Administration. Potential widespread atmospheric pollution with toxic chemicals under development for use in Federal missile and aerospace activities has been presented. Both DOD and NASA insured compliance with recommended guidelines issued with the Public Health Service policy statement on beryllium. The Public Health Service has recommended that catalytic reduction units be installed to reduce the emissions of nitric oxides to the atmosphere from the nitric acid plants at the Volunteer Army Ammunition Plant in Tennessee. Cooperation continued with the Tennessee Valley Authority in its plan to control air pollution from its new plant in Cumberland City, Tennessee. The air pollution plan for 14 departments and agencies covers proposed corrective actions for fiscal years 1969 through 1973 affecting approximately 435 projects. The Bureau of the Budget approved for financing in 1969 all projects for facilities located in the New York City, Chicago and Philadelphia metropolitan statistical areas, the Washington, D. C. metropolitan area, areas where violation of regulations exist, areas where health hazards exist, and interstate areas where DHEW has started abatement proceedings. A list of these projects is presented. A list of the projects scheduled to start in 1968 is also

09137

Cyrankiewicz, J.

PERMISSIBLE CONCENTRATION OF AIR POLLUTION. Dziennik Ustaw (Warsaw), No. 42:403-404, Oct. 8, 1966. Translated from Polish. Joint Publications Research Service, Washington, D. C., R-9119-D, 3p., Jan. 30, 1968.

Maximum allowable concentrations of SO2, H2SO4, NOx, H2S, CO, gasoline, dust, and CS2 in "special protection areas" and "protected areas" in Poland are outlined. Special protection area includes areas of health resorts and health protection areas, national parks, and reservations of natural resources. Protected area includes other terrains of the land, with the exception of land occupied by manufacturing establishments or other sources of pollution and protective zone areas. Exceptions for a specified period can be granted in the following cases: 1) Difficulties involved in the installation of air purification facilities in the manufacturing establishments due to exceptionally high investment costs, lack of opportunities to find a producer of such equipment or appropriate technical methods. 2) Excessive agglomeration of manufacturing establishments in a given area, which causes air pollution in excess of the permissible concentration in spite of the utilization of appropriate purification facilities. 3) When it is necessary to build in a given area a new manufacturing establishment which will result in exceeding the permissible concentration of air pollution in spite of the fact that the most adequate equipment has been installed to reduce the pollution.##

09281

California Motor Vehicle Pollution Control Board, Los Angeles

SMOG: THE SILENT ENEMY. (FOURTH BIENNIAL REPORT FOR CALENDAR YEARS 1965-66.) 32p., Jan. 1967.

California has led the world in the fight for cleaner air. Nowhere are found such dynamic and aggressive programs, both on local and Statewide levels. Nowhere are there more dedicated men and women engaged in the effort. Admittedly, the automobile is a major factor in befouling our atmosphere. The ultimate solution to the motor vehicle pollution problem may lie in a completely redesigned automobile engine or in a new motive power source. The Board has thoroughly examined these possibilities, such as the turbine and battery-powered car, and is encouraged for the future, perhaps a decade hence. But, until that time, the State must proceed with its present plans to reduce auto-created pollution with workable control systems or engine modifications. Through sustained, persistent efforts by a determined Administration, State Legislature, and Board, the automobile industry has acknowledge ar complied with California|s leadership. Today, emission control is a fundamental factor in automobile engineering. For the first tim all the world|s engine designers are hard at work on the problem. Today, emission control is |built-in,| not |added on,| to every Detroit product. This represents a phenomenal advance in the spac of six and a half years. It will continue to result in a better product for the California car purchaser. All new California automobiles now come equipped with both crankcase and exhaust emission control systems. The Highway Patrol is making random roadside checks to make sure that motorists are complying with the law, and the Department of Motor Vehicles has co-operated in carrying out the necessary registration procedures for controlled vehicles. Stricter emission standards must be applied in 1970. Oxides of nitrogen control systems will be incorporated into existing controls, if they are in harmony with hydrocarbon and carbon monoxide controls. Evaporative losses must also be reduced with a consequent economic saving to the motorist. The Board is actively seeking and hopes to find a simple portable measurement device for all emissions. This would simplify annual emission inspection for all vehicles. There is no doubt that as time passe emission reduction systems will improve rapidly. The art and science of emission control are still in their infancy, but moving ahead.

09285

H. Wolozin

FEDERAL FISCAL POLICY IN AIR POLLUTION CONTROL. (PREPARED DISCUSSION.) Preprint, Massachusetts Univ., Boston, Dept. of Economics, 4p., 1966 (Presented at the National Conference on Air Pollution, Washington, D. C., Dec. 12-14, 1966.)

Important questions to consider in determining policies on air pollution are how much is presently known about polluted air, how extensive are damages and whether the damages ar progressive and irreversible. Policy recommendations would be different if time were not of the essence and damages were remediable. Measurement techniques are confined to direct effects of high levels of contamination. It is recommended that priority be given to research on measuring indirect and insidious effects of low level exposures of long duration. The air pollution problem poses the need for serious considerations of alternatives to influence management decisions. Research is required to determine if effective control will not ultimately demand basic modification of traditional government-industry relations. It is recommended that air pollution authorities be given the authority and resources to pay for air pollution filtering and control devices or bear the cost of modifying existing equipment. In return authorities would receive the right through public commissions to participate in corporate decisions affecting emission of pollutants.##

09370

Stockton, Edward L. and Winthrop C. Shook

AUTOMATIC AIR MONITORING AND TELEMETERING TO CENTRAL POINTS IN ALLEGHENY COUNTY. J. Air Pollution Control Assoc., 18(3):162-164, March 1968.

In 1968 an automatic monitoring system will supplement existing air sampling stations in Allegheny County (Pittsburgh). This system will measure pollutant levels and weather conditions at several remote sites. "On-site" recorders are equipped to telemeter the data in analog form to a central station. At the central station a multipoint recorder is supplied for each pollutant measured. This basic system, purchased for a modest initial investment, has complete capabilities for future expansion. An estimated fifteen sites will provide representative pollution data for Allegheny County. However, the basic system can be expanded to include industry installed monitoring stations--a possibility now being considered. Further expansion to a complete data management system including a computer based data logger to calculate emission inventory, peak averages, and other control data is also provided for. (Authors' Abstract Modified)##

09765

Minnesota State Board of Health, Minn.

A REPORT ON AIR POLLUTION IN MINNESOTA. MSBH-L-172, p. 1-27, July 31, 1966.

Air pollution is of increasing significance in the State and requires the attention of the State. The legal problems of authority, obligations and jurisdiction are complex and require careful deliberation for their resolution. Prolonged deliberation should not delay the establishment of a State control program. Existing State laws are sufficient for the initial establishment of a technical air pollution control program by the State Board of Health if adequate funds are made available.

10205

Secretary of Health, Education, and Welfare

PROGRESS IN THE PREVENTION AND CONTROL OF AIR POLLUTION. FIRST REPORT OF THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE TO THE UNITED STATES CONGRESS. PURSUANT TO PUBLIC LAW 90-148, THE AIR QUALITY ACT OF 1967. 2nd Session, 90th Congress, Senate Document No. 92, 85p., June 28, 1968.
GPO

Recent activities initiated under the Air Quality Act of 1967, which was signed into law on November 21 are described, and the air pollution problem as a whole is placed in historical perspective, summarizing the continuing efforts being made to cope with it. Included are: (1) the progress and problems associated with control of automotive exhaust emissions and the research efforts related thereto; (2) the development of air quality criteria and recommended emission control requirements; (3) the status of enforcement actions taken pursuant to this Act; (4) the status of State ambient air standards setting, including such plans for implementation and enforcement as have been developed; (5) the extent of development and expansion of air pollution monitoring systems; (6) progress and problems related to development of new and improved control techniques; (7) the development of quantitative and qualitative instrumentation to monitor emissions and air quality; (8) standards set or under consideration pursuant to title II of this Act; (9) the status of State, interstate, and local pollution control programs established pursuant to and assisted by this Act; and (10) the status of the President's Air

10553

Huenigen, E.

PRESENT STATUS OF EXHAUST GAS CONTROL IN THE DDR (EAST GERMANY). ((Bisherige Ergebnisse der Abgasbekampfung in der DDR.)) Text in German. Freiberger Forschungsh. A. 387:17-30, 1966.

The research council on the control of internal combustion engine exhaust gases of the German Democratic Republic (DDR) set as its goals in 1964: a) the improvement of the quality of diesel motor exhausts; b) reduction of the hazards from exhausts of two-phase gasoline motors; c) development of suitable analytical methods, measurement installations and testing programs; d) an extensive detoxification of exhaust gases from the diesel motors of specialty vehicles. In the furtherance of these aims, a thorough state-of-the-art study of diesel smoke density measurement was carried out, including actual testing of over a dozen different types of instruments. The results of these tests and studies are described and illustrated. Difficulties in the determination of CO, CO2, nitrogen oxides, hydrocarbon residues, and benzopyrene, are discussed. An investigation of the influence of a French after-burner device on CO emission and smoke density showed unsatisfactory abatement results. The use in West Germany of "liquid gas" as an automotive fuel yielding low CO and hydrocarbon exhausts is mentioned.##

11421T

Eilers, H.

AIR POLLUTION. IV. ALERT AND ALARM REGULATIONS IN SOME FOREIGN CITIES. ((Waakzaamheids- en alarmstelsels in enkele buitenlandse steden.)) Translated from Dutch. Ingenieur, 80(10):G33-G38, March 8, 1968. 17 refs.

Air pollution alert and alarm regulations in Ingolstadt, and the Urhr area, Germany, New York city, and Los Angeles County are discussed in detail, tabulated and compared. The differences in predominant types of pollution - eg photooxidation in Los Angeles, SO2, soot, etc. in New York, and SO2 in the

Urhr area - are noted, with a detailed explanation of the complexities of Los Angeles smog and of the various alarm stages used. The possibility and desirability of introducing an alarm system in the Netherlands is discussed. With increased motorization, the chance for damage to horticultural districts is increasing, and an alarm system, resulting in the limitation of traffic under unfavorable conditions, may be required.##

13366

Japan. Prime Minister's Office.

1969 WHITE PAPER ABOUT PUBLIC NUISANCES. (Kogai hakusho). Text in Japanese. (Prepared in collaboration with 11 ministries and agencies, Government of Japan, for submission to the Japanese Diet). Tokyo, Printing Bureau of the Ministry of Finance, 1969, 230p.

This report summarizes the status, monitoring techniques, and management, including laws, of air and water pollution, noise and vibration, and soil erosion in Japan in April 1969. Particulate air pollutants in Japan are of four types: falling dust, which contains large particles and includes soot from burning coal or muddy dust; sulfur oxides, which are becoming increasingly important because of the increasing use of petroleum in recent years; floating dust, which has very small particles and includes mainly molecules of metallic compounds from burning materials and carbohydrates; and engine exhaust gas containing CO, NO2, hydrocarbons, and aldehydes. The amount of falling and/or floating dust has been gradually decreasing with the decreasing use of coal, especially in large industrial cities. At the same time, sulfur oxides, especially SO2, have been gradually increasing and have the highest concentration (more than 1.5 mg SO3/100 sq cm/day) in Kawasaki, Yokohama, Nagoya, Tokyo, Osaka, Muroran, and Yokkaichi. Among the harmful effects of polluted air on the human body, the ill effects on the respiratory tract (especially on the lungs) are most important. Chronic bronchitis, bronchial asthma, pulmonary emphysema, pulmonary fibrosis, pulmonary cancer, and cor pulmonale are the main lung diseases induced by polluted air. 3, 4-Benzopyrene, which is a component of automobile exhaust gas, was experimentally proved to be carcinogenic. In May 1962, the law entitled 'Provisions on the emission of smoke' was established to control the ambient air system, and three large city groups (Tokyo-Yokohama, Osaka-Kobe, and Kitakyushu) were designated as air-polluted areas. Several cities, including Yokkaichi, were subsequently designated. This law was improved in May 1968, especially from the viewpoint of prevention. A law which sets limits for automobile exhaust-gas emissions has also been in force since September 1966. Air pollution is monitored in Japan at more than 170 points. In recent years, several techniques of preventing air pollution have been devised with varying success: use of activated carbon or activated manganese dioxide to reduce SO2 concentrations; quantitative and qualitative measurement of air pollution severity using a simulation model of a polluted area; modification of internal-combustion engines; and development of electric automobile engines.

STANDARDS AND CRITERIA

00157

Maga, John A. and John R. Kinosian

MOTOR VEHICLE EMISSION STANDARDS - PRESENT AND FUTURE. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vol. 12, New York, Society of Automotive Engineers, Inc., 1966, p. 297-306. 10 refs. (Presented at the SAE Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1966.)

In California, the State Dept. of Public Health has established motor vehicle emission standards for exhaust hydrocarbons, carbon monoxide and smoke; for fuel tank and carburetor evaporative losses; and for crankcase hydrocarbon emissions. The data on which the standards are based and the need for improved measurement procedures are discussed. At this time, exhaust emission standards for oxides of nitrogen and for odor are being considered as additional standards. Future standards may rate hydrocarbon emissions according to their smog potential. Another possible change that is discussed is to specify the quantity rather than the concentration of pollutants that may be emitted from the exhaust of motor vehicles.##

00411

K. Horn

(THE PROBLEM OF HYGIENICALLY PERMISSIBLE LIMITING CONCENTRATIONS OF AIR POLLUTION.) Zur Frage der Hygienisch zulassigen Grenzkonzentrationen fur Luftverunreinigungen. Angew. Meteorol. (Berlin) 5 (Special Issue) :39-43, 1965. Text in Ger.

The problem of determining permissible limits of air pollution is discussed. After listing four categories of pollution ranging from decreased visibility and injury to sight and smell to acute illness and possibly death, the aurthor states that pollution should be kept below the limits of the first category. He distinguishes between limits permissible in a factory area and in a residential area, the first being higher. Permissible limits for 40 chemicals established in 1963 for single occurrences and average 24 hour concentrations for East Germany are tabulated.##

01149

W. W. Stalker and C. B. Robinson

A METHOD FOR USING AIR POLLUTION MEASUREMENTS AND PUBLIC OPINION

TO ESTABLISH AMBIENT AIR QUALITY STANDARDS . J. Air Pollution Control Assoc. 17, (3) 142-4, March 1967. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-25, 1966, Paper 66-95.)

A household emission and opinion survey was conducted in Jefferson County, Alabama, to provide information that could be correlated with air quality data. A 21-station air sampling network was operated for one year previous to the opinion survey. Public attitude toward air pollution as a general nuisance in metropolitan Birmingham can apparently be estimated from dustfall, and to some extent, from suspended particulate levels. Based on public opinion versus ambient air pollutant level correlations, and assuming that no more than one-third of the people should be adversely affected by air pollution, it was found that ambient particulate levels should not exceed 30 tons/sq. mi./mo. as dustfall nor 150 micro gs/cu. m as suspended particulate matter. When dustfall reaches 40 tons/sq. mi./mo. or suspended particulate matter reaches 230 micro gs/cu. m, 50% of the households say that air pollution has become a general nuisance. (Author summary)##

14475

Huenigen, Edmund and Wolfgang Prietsch

ON THE PROBLEM OF LIMITING EMISSION OF TOXICANTS BY MOTOR VEHICLES IN EUROPE. (Zum Problem der Begrenzung der Schadstoffemission bei Kraftfahrzeugen in Europa). Text in German. Motortech. Z. (Stuttgart), 30(7):256-259, July 1969. 24 refs.

Maximum allowable emission concentrations in exhaust from motor vehicles in Europe are presently being worked out by an organization of the United Nations, the European Economic Commission. It has been suggested that the MAC values be determined by the 'European driving cycle exhaust gas test' (EFA). Maximum allowable concentrations in the atmosphere have been set by individual European countries. A table compares the values set by the German Democratic Republic, the German Federal Republic, and Russia and shows that the limits are far more stringent in the GFR. The toxicological importance of carbon monoxide, hydrocarbons, and nitrogen oxides in each country will form the basis for working out uniform European limits. Based on the MAC for CO and on the premise that the MAC values should correspond to the toxicological importance of the pollutants, the MAC ratio for CO, hydrocarbons, and nitrogen oxides is 1:1.9:0.1. As measurements show, at present only CO emissions need to be limited. The other toxicants will not be limited until more measurements have brought detailed information concerning the relationship between emissions and air pollution. Limitations of CO emissions during idling is urgently needed.

14634

Dmitriyev, M. T.

APPLIED ASPECTS OF THE RADIATION CHEMISTRY OF A NITROGEN-OXYGEN SYSTEM. (Prikladnyye voprosy radiatsionnoy khimii sistemy azotkislorod). Text in Russian. Zh. Prikl. Khim., 41(5):973-982, May 1968. 21 refs.

Relationships were derived for determining the number of ions formed per unit time and the steady-state concentration of ions and electrons for a known radiation dose in air. It was established that concentrations of ozone occurring in normal air are produced by 25-30 r doses, and 50-60 r imparts an ozone odor to the air. Doses of about 3000 r produce the odor of nitrogen oxides. Up to 250 r, the concentration of ozone and nitrogen oxides does not reach the maximum permissible value. Maximum permissible dose for drinking water was established at 6 Mr based on nitrate ion, or 1.2 Mr based on nitrite ion; 0.05-0.4 Mr is recommended for purification of tap water; 0.05-1.2 Mr for water under field conditions, and 1 Mr for spring water. The maximum permissible dose for ammonia is 0.4 Mr. Maximum permissible doses for foodstuffs are as follows: liquids-1.2 Mr, moist foods-11 Mr, frozen foods-15 Mr, dry concentrates-95 Mr.

14772

Weaver, Neill K.

ATMOSPHERIC CONTAMINANTS AND STANDARDS. STATUS REPORT. J. Occupational Med., 11(9):455-461, Sept. 1969. 23 refs.

The Federal Air Quality Act of 1967 furnishes the methodology for the abatement of air pollution. Its provisions include the designation of air quality control regions and the issuance of air quality criteria and control technology documents, which will be followed by the promulgation of ambient air standards and emission standards at regional, state, and local levels. The atmospheric pollutants of current major concern are sulfur oxides, particulates, nitrogen oxides, hydrocarbons, oxidants, carbon monoxide, fluorine, and lead. Their toxic and other deleterious effects, exhibited at various concentration-time exposures, can be related to levels reached by the individual contaminants in the air of cities. While such an evaluation does not allow for possible interactions between pollutants, it appears that sulfur dioxide, oxidants, and carbon monoxide may be harmful to human health when the agents are concentrated, as in focal areas of emission or during sustained meteorologic inversions. Gains to be achieved by controlling these and other contaminants during non-peak conditions are probably derived from aesthetic, economic, and welfare benefits rather than health. Abatement procedures should eliminate rises in pollutant levels beyond the average ranges generally present in urban ambient air. (Author summary modified)

01532

S.L. Dobko

AIR POLLUTION IN ALBERTA. Can. J. Public Health (Toronto), 57(2):84-86, Feb. 1966.

The growth of the petroleum industry in Alberta Province which nevessitated regulation for air pollution control is discussed. Regulations, adopted in September 1961, cover four types of pollutants - dust, smoke, odorous material, and toxic or noxious material. All new industry plans must meet these regulations and existing industry must comply with them within five years. Stack monitoring and two types of area monitoring to detect violations of the regulations are described.##

01955

J. R. Goldsmith

SOME IMPLICATIONS OF AMBIENT AIR QUALITY STANDARDS. Arch. Environ. Health 4, 151-67, Feb. 1962. (Based in part on a paper presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 13, 1961.)

Author discusses the parameters of the air quality standards in California, starting with the efforts in 1959 and updating the progress to 1962. Allowable concentrations of oxidants are given; a general discussion of health based on air quality studies is given and, the general policy of California air quality standards is reviewed.##

02010

E.A.J. Mahler

STANDARDS OF EMISSION UNDER THE ALKALI ACT. Proc. (Part I) Intern. Clean Air Cong., London, 1966. Paper III/12). PP. 73-6.

The evolution of standards of emission under the Alkali Act over the past 100 years is briefly reviewed. The necessity for considering heights of discharge of pollutants as well as their concentration in the emissions and mass rates of discharge to atmosphere is stressed. It is also indicated that standards should be simply and clearly expressed in such a manner that their due observance can readily be checked by short and simple tests. An outline is given of the principles adopted in arriving at the current standards and these, both in regard to concentrations in emissions and heights of discharge, are listed. The aurhor expresses the personal view that present tendencies in ever increasing size of production units and complexity of operations on one site must inevitably lead to necessity in the future further to reduce emissions. Because of the cost of such a step he suggests that setting up and adoption of international standards is a desirable end. (Author abstract)##

02580

MAXIMUM PERMISSIBLE CONCENTRATIONS OF HARMFUL SUBSTANCES IN ATMOSPHERIC AIR POPULATED PLACES. (Predel' no dopustimye kontsentratsii vrednykh veschestv v atmosfernom vozdukhe naselennykh mest.) Hyg. Sanit. 29, (5) 166-8, May 1964.
CFSTI: TT65-50023/5

A list of maximum permissible concentrations of harmful substances in the atmosphere of populated areas in the USSR, as of June 20, 1963.##

03007

CALIFORNIA STANDARDS FOR AMBIENT AIR QUALITY AND MOTOR VEHICLE EXHAUST (TECHNICAL REPT.) California State Dept. of Public Health, Berkeley. 1959. 129 pp.

The salient points in the table of contents are: I. The standards and their significance. II. Technical bases for standards for the quality of ambient air. III. The technical bases for motor vehicle exhaust standards. In establishing the standards, an attempt was made to determine what effects the various pollutants were known to have at various levels of concentration on human health and comfort, on animals, and plants, and on visibility. The resulting air quality standards together with data concerning motor vehicle emissions and their reactions then became the bases for motor vehicle exhaust standards. The air standards do not establish a fine line below which is good air and above which is bad air. They indicate the approximate point at which air under some circumstances may produce undesirable effects.##

03583

CALIFORNIA STANDARDS FOR AMBIENT AIR AND MOTOR VEHICLE EXHAUST (TECHNICAL REPT.). California State Dept. of Public Health, Berkeley. 1959. 16 pp.

These standards are presented as a yardstick which may be applied in maintaining and improving air quality. A graded set of ambient air standards was established which recognized the relationship between the seriousness of the effect of the pollutant and the urgency of control. Three levels of air pollutants were defined: adverse, serious, and emergency. The standards of motor vehicle exhaust contaminants are: hydrocarbons-275 ppm by volume as measured by a hexane-sensitized nondispersive infrared analyzer; carbon monoxide-1.5% by volume measured by a nondispersive infrared analyzer. The exhausts are to be measured during an eleven-mode operating cycle.##

05293

Pennsylvania State Dept. of Health, Harrisburg, Air Pollution Commission. (Apr. 25, 1967). 5 pp.

AMBIENT AIR QUALITY CRITERIA.

In accordance with Section 5 (f) (8) of the Pennsylvania Air Pollution Control Act, the Act of January 8, 1960, P. L. 2119, on April 25, 1967 the Air Pollution Commission adopted the Ambient Air Quality Criteria, which will be used by the Commission in: 1. Evaluating the results of community air pollution studies conducted by the Department of Health. 2. Determining the need for air pollution control regulations in regions of the Commonwealth to achieve these objectives. 3. Developing rules and regulations in accordance with Section 5 (f) (2) of the Pennsylvania Air Pollution Control Act. The sampling and analytical procedures employed to measure ambient levels of contaminants are to be consistent with obtaining accurate results which are representative of the conditions being evaluated.##

06469

J. Just

CRITERIA FOR THE EVALUATION OF ATMOSPHERIC AIR POLLUTION AND STANDARDS OF AIR QUALITY USED IN POLAND. Warsaw Inst. of Hygiene, Poland. (Presented at the World Health Organization Inter-Regional Symposium on Criteria for Air Quality and Methods of Measurement, Geneva, Switzerland, Aug. 6-12, 1963, Paper No. WHO/AP/12.) (July 23, 1963). 6 pp.

A general discussion is presented of the air conservation problem in Poland. Some ideas are advanced regarding the proper location of newly constructed industrial sources and restrictions imposed upon them in terms of pollutant concentrations. Maximum allowable concentrations for sulfur dioxide, sulfuric acid, nitrogen oxides, hydrogen sulfide, and carbon disulfide are tabulated.

06885

Gol'dberg, M. S.

HYGIENIC CRITERIA OF AIR PURITY IN POPULATED AREAS (ACCORDING TO MATERIALS OF THE GENEVA SYMPOSIUM). ((O kriteriyakh gigienicheskoi otsenki chistoty atmosfernogo vozdukha naselennykh mest)) ((Po materialam Zhenevskogo simpoziuma)). Hyg. Sanit. (Gigiena i Sanit.), 30(1):90-98, Jan. 1965. Translated from Russian.
CFSTI: TT 66-51033

In recent years there has been a steady increase in hygienic research on air in populated areas. The need for planning of measures for the control of atmospheric pollution is becoming increasingly urgent. The necessity for an international discussion of this subject, which would be a starting point for all measures undertaken for the sanitary protection of urban air, led the World Health Organization to convene an interregional symposium in Geneva from the 6th to the 12th of August, 1963, which was devoted to criteria for the quality of atmospheric air and methods of its investigation. The discussion was centered on the maximum permissible concentrations of harmful substances in urban air. After a lively discussion, the symposium adopted Prof. V. A. Ryazanov's proposal to establish a unified scale of standards for the quality of air by merging together the Soviet and American standards. In this way, an international scale for the atmospheric pollution has been established for the first time. The symposium drew up recommendations on the trend in medical research on the effect of atmospheric pollution on the health of the population, and a further elaboration of criteria and standards of atmospheric air quality in populated areas. Participants at the symposium also noted the necessity for the further development of scientific research on the mechanism of development of fibrotic pulmonary reaction induced by atmospheric pollutants, and for studies of the reaction of the mucosa of the respiratory tract, ciliary activity, etc. The symposium pointed out the necessity for paying special attention to studies of new synthetic chemicals which contaminate the atmosphere when discharged by industrial enterprises or when used in the household, as in the case of disinfectants.##

07197

RECOMMENDATIONS FOR ALLOWABLE CONCENTRATION (1966.) Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo) 4(4):62-66, 1966. Text in Japanese.

A report is given by a committee of the Japanese Association of Industrial Health on "Allowable concentration". The values of allowable concentration are worked out for a healthy man working 8 hr per day doing moderate work. Proper consideration must be given to cases in which more than 8 hr of exposure take place, more than one pollutant is involved, or the concentration of pollutants increases suddenly during the work schedule. Included is a discussion on dust measurement. It is important to measure dusts having a Stokes radius of less than 5 microns, especially at a height of 1 to 1.5 m from the ground. The relation between the source of dust and the point of measurement is illustrated.##

07490

Suzuki, T.

ON THE PERMISSIBLE CONCENTRATION OF AIR POLLUTANTS IN SOME COUNTRIES. Text in Japanese. J. Jap. Petrol. Inst. Tokyo, 7(2):87-91 Feb. 1964. 4 refs.

There are no "international" permissible values of air pollutant concentrations at present. The maximum allowable concentrations and their methods of determination differ between countries. Values obtained in the Soviet Union, Czechoslovakia, West Germany, and the United States are compared. The values of permissible concentration are very low in the Soviet Union, even seemingly impossible of realization. Permissible values for 32 substances are tabulated. In West Germany, the values are expressed by MIK (Maximale Imission Konzentration) recommended by the VDI (Verein Deutscher Ingenieure). According to definition, the "Imission" value is the concentration of the elements found undesirable for "normal air". With MIK, only SO2, nitrogen oxides, H2S, and chlorine are regulated. Consideration of exposure time is also given. Values obtained in Czechoslovakia are for 16 materials determined as was done in the Soviet Union. As for the United States, present methods of establishing MAC (Maximum Allowable Concentration) are described. Values for SO2 determined in California are tabulated.##

08420

Brodovicz, Bey A.

AIR QUALITY CRITERIA FOR PENNSYLVANIA. J. Air Pollution Control Assoc., 18(1):21-23, Jan. 1968. 4 refs.

In late 1965 the Pennsylvania Air Pollution Commission appointed a Council of Technical Advisors to develop air quality criteria. Recently this Council set forth its recommendations for ten pollutants. The philosophy of the Council is expressed. The major difficulties and rationale are mentioned. The recommendations are given and the potential use of the criteria is also explained. The establishment of firm guidelines of air quality is based solely on consideration of effects both on health and aesthetics. The criteria are broken into two distinct groups; air basin average and single point measurement. The pollutants included: 1. Suspended particulates (total), 2. Settled particulates (total), 3. Lead (tentative), 4. Beryllium, 5. Sulfates (as H_2SO_4), 6. Sulfuric acid mist, 7. Fluorides (total soluble, as HF), 8. Sulfur dioxide, 10. Oxidants, 11. Hydrogen sulfide, and 12. Carbon monoxide.##

08803

Hunigen, E., and W. Prietsch

PROBLEMS AND METHODS OF SOLUTION OF ELIMINATING NOXIOUS SUBSTANCES FROM INTERNAL COMBUSTION ENGINES. ((Probleme und Losungswege der Schadstoffbeseitigung bei Verbrennungsmotoren.)) Translated from German. Technik, (Berlin), 21(6):377-383, June 1966.

The composition of exhaust from internal combustion engines is discussed. Maximum permissible concentrations of harmful components are tabulated for five countries with standards for the following substances: hydrocarbons (benzene, etc.), aldehydes (formaldehyde, etc.), carbon dioxide, sulfur oxides, nitrogen oxides, lead (and tetraethyl lead), mineral oil mist, and carbon. Some equipment for the measurement of air pollutants is touched upon, including a description of an East German continuous sampling apparatus for hydrocarbons, CO, CO_2, and O_2.##

BASIC SCIENCE AND TECHNOLOGY

00001

A. P. Altshuller and I. R. Cohen

ATMOSPHERIC PHOTOOXIDATION OF THE ETHYLENE-NITRIC OXIDE SYSTEM.
Intern. J. Air Water Pollution, Vol. 8: 611-632, 1964.

Because ethylene is not only a phytotoxicant but also is reactive in the photochemical type of air pollution, a detailed study has been made of the photooxidation of ethylene-nitrogen oxide mixtures in air. The effects were determined of varying the concentrations of ethylene between 0.1 and 5 ppm and of nitric oxide between 0.2 and 10 ppm on the rate of ethylene consumption, the rate of nitrogen dioxide formation and on the yields of various products. The greater part of the ethylene consumed could be accounted for in the products as formaldehyde or carbon monoxide. It was not possible to obtaina nitrogen balance in this system, although a small amount of methyl nitrate was produced. Ethylene-nitrogen oxide mixtures react rapidly in static irradiations at reactant co5centrations below 0.5 ppm. For example, photooxidation of a mixture initially containing 0.2 ppm of ethylene and 0.2 ppm of nitric oxide resulted in a nitrogen dioxide peak in 30 min and half conversion of ethylene in about 80 min. At equal ratios of reactants, ethylene-nitric oxide mixtures actually are more reactive at lower concentrations of reactants. In order to explain the experimental results it appears that free radical chain reactions must be postulated. A discussion of various mechanistic reaction steps is given. (Author)##

00034

J.J. Bufalini A.P. Altshuller

THE EFFECT OF TEMPERATURE ON PHOTOCHEMICAL SMOG REACTIONS.
Intern. J. Air Water Pollution, Vol. 7:769-771, 1963.

Results of measurements made for the photo-oxidation of trans-2-butenenitric oxide in air and for 1,3,5-trimethylbenzene-nitric oxide in air are discussed. The initial concentrations of the reactants in the two systems were as follows: trans-2-butene, 10 ppm; nitric oxide, 4.2 ppm; 1,3,5-trimethylbenzene, 6 ppm; nitric oxide, 3 ppm. The conversion times for both systems decreased by approximately a factor of two and the rates increased by a factor of two when the temperature was increased from 20 to 40 degrees. The conversion time at the nitrogen dioxide maximum and the rate of half-conversion of nitric oxide to nitrogen dioxide are two independent measures of reactivity which give good agreement on a relative basis. Similarly which give good agreement on a relative basis. Similarly on a relative basis, good agreement is obtained on the times at which the hydrocarbon reaches half of its initial concentration and the normalized rates at these times in the reaction although they do represent somewhat different measures of reactivity. The results from these two systems should not be taken as indicating that temperature changes are independent of the nature of the hydrocarbon used as a reactant. The investigation showed that temperature difference of a few degrees can cause measurable changes in photo-oxidation rates.##

00053

R.J. Ayen Y.S. Ng

CATALYTIC REDUCTION OF NITRIC OXIDE BY CARBON MONOXIDE. Intern. J. Air Water Pollution Vol. 10:1-13, Oct. 11, 1965

Rate data for the catalytic reduction of NO with CO were obtained using a flow reactor operated differentially at atmospheric pressure and at temperatures of 160, 200, 220 and 240 C. Nitric oxide and carbon monoxide partial pressures were varied from 0.005 to 0.05 atm using helium as a diluent to bring the total gas flow to 2000 cc/min. A dual site mechanism was postulated for the reaction in which the rate determining step was a surface reaction between adjacently adsorbed CO and NO molecules. From the data, rate and adsorption constants were evaluated for the corresponding rate expression. This expression is of practical use in the design of a catalytic converter to removre oxides of nitrogen from automotive exhaust gases and other exhaust streams. (Author)##

00128

K. W. Egger and S. W. Benson

NITRIC OXIDE AND IODINE CATALYZED ISOMERIZATION OF OLEFINS. VI. THERMODYNAMIC DATA FROM EQUILIBRIUM STUDIES OF THE GEOMETRICAL AND POSITIONAL ISOMERIZATION OF N-PENTENES. J. Am. Chem. Soc. 88, 236-40, Jan. 20, 1966.

The equilibrium of the iodine catalyzed gas phase isomerization of 1-pentene and 2-pentene was studied over a temperature range from 114.5 to 335.3 degrees. The measured values for constants of both the positional and the geometrical isometizations yield straight lines when plotted vs. 1/T(degree K). Entropy and enthalpy values were derived by application of least-square fits of data to linear equations using a standard computer regression program yield with standard errors (for a mean temperature of 500 K.) The data can be equally well fitted to both linear and quadratic equations. The data for the heats of isomerization are in very good agreement with values calculated from the data on the heat of formation reported by Prosen and Rossini and quoted in the API tables. The entropy differences between the isomers obtained from the direct experimental data agree reasonably well with the comparative estimates of Kilpatrick, et al. Values for partial group contributions and corrections thereof were calculated from the data of this work and results reported earlier from related studies on n-butenes and 1,3-pentadienes. They are in excellent agreement with earlier estimates.##

00238

E.R. Stephens, F.R. Burleson, E.A. Cardiff

THE PRODUCTION OF PURE PEROXYACYL NITRATES. J. Air Pollution Control Assoc. 15, (3) 87-9, Mar. 1965. (Presented at Sixth Conference on Methods in Air Pollution Studies, California State Dept. of Public Health Berkeley, Jan. 6-7, 1964.)

Three different reaction systems have been used to prepare the first three members of the PAN homologous series Two of these involve photolysis by ultraviolet black light lamps and one is a dark reaction. All are carried out in the gas phase: (1) Photolysis of dilute (100 ppm) mixtures of a symmetrical olefin (e.g., 2 butene) with eigher nitric oxide or nitrogen dioxide in dry oxygen or air. This was the original method and it most closely resembles the way in which these compounds are formed in polluted atmospheres. (2) Photolysis of dilute alkyl nitrite in oxygen. This is the preferred method for PAN and PPN. It was successful for the preparation of the four carbon homologue. (3) The dark reaction of the appropriate aldehyde with NO_2 and O_3 at low concentration in oxygen. This is the preferred method for the preparation of the four carbon homologue. The starting material is n-butyraldehyde. In all cases the sam e gas chromatographic procedure is used for purification. (Author)**

00354

L. F. Phillips H. I. Schiff

MASS-SPECTROMETRIC STUDIES OF ATOMIC REACTIONS. V. THE REACTION OF NITROGEN ATOMS WITH NO_2. J. Chem. Phys. 42, (9) 3171-4, May 1, 1965.

The reaction of N atoms with NO_2 was studied in a fast flow system, using a mass spectrometer to monitor the composition of the reaction mixutre. The rate constant for removal of NO_2 by N was found to be 1.8 plus or minus 0.2 to the -11th power cc/mol/sec. By a combined mass-spectrometric and photometric method the relative contributions of the different primary reactions were determined as follows (errors shown are standard deviations): N plus NO_2 YIELDS N_2O plus O (0.43 plus or minus 0.04); N plus NO_2 yields $2NO$ (0933 plus or minus 0907); N plus NO_2 yields N_2 plus O_2 (0.10 plus or minus 0.12); N plus NO_2 yields N_2 plus $2O$ (0.13 plus or minus 0.11). (Author)**

00357

H. E. Avery R. J. Cvetanovic

REACTION OF OXYGEN ATOMS WITH ACETALDEHYDE. J. Chem. Phys. 43, (10, Part I) 3727-33, Nov. 15, 1965.

The reaction of the ground-state triplet oxygen atoms with acetaldehyde at room temperature has been reinvestigated. Two different sources of ocygen atoms have been used: mercurcy photosensitized decomposition of nitrous oxide and photolysis of nitrogen dioxide at 3660 A. The results confirm the earlier conclusion from this Laboratory that the primary attack involves the abstraction of the aldehydic H atoms and not an insertion into the CH bonds of the aldehyde nor other primary steps suggested recently in the literature.##

00612

E. Miescher

ANALYSIS OF THE SPECTRUM OF THE NITRIC OXIDE MOLECULE (ANNUAL SCIENTIFIC REPORT NO. 2). Basel Univ., (Switzerland), Dept. of Physics. (Rept. No. AFCRL-66-35.) Oct. 2, 1965. 16 pp.
CFSTI, DDC: AD 628 818

The absorption spectrum of the fourth isotope N15018 was photographed with high resolution between 1770 and 1380 angstrom units. With medium resolution spectra of the four different isotopes N14016, N15016, N14018, N15018, have been obtained down to wavelenghts beyond 1300 angstrom units. New Rydberg-states ns, np, nd, nf... are reported. Data for a lower vibrational level of the I2 sigma plus non-Rydberg state are given. The former non-Rydberg state P2 pi is discussed and it is suggested to assign it as level v equal 4 of the L2 pi state. (Author abstract##

00700

I.C. Hisatsune

NITROGEN OXIDES - NECESSITY FOR A SYSTEMATIC APPROACH IN THEIR STUDIES. Preprint. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965, Paper No. 65-169.)

The nitrogen oxides, oxyacids, and ocyhalides, most of which are highly reactive and thermodynamically unstable, can be identified conveniently from their infrared absorption spectra. However, there are numerous coincidences in the positions of the absorption bands of these molecules, and they have lead often to incorrect assignment of the spectra. Systematic studies of the vibrational spectra of these compounds have eliminated these difficulties, and characteristic spectra of many of them have been identified. Progress in these studies and in the use of the spectra data to determine thermodynamic properties are reviewed. (Author abstract'##

00923

J. N. Pitts, Jr., J. H. Sharp, and S. I. Chan

EFFECTS OF WAVELENGTH AND TEMPERATURE ON PRIMARY PROCESSES IN THE PHOTOLYSIS OF NITROGEN DIOXIDE AND A SPECTROSCOPIC-PHOTOCHEMICAL DETERMINATION OF THE DISSOCIATION ENERGY. J. Chem. Phys., 40(12):3655-3662, June 15, 1964.

The quantum yields of oxygen production in the photolysis of nitrogen dioxide have been determined at a series of wavelengths at room temperature and as a function of temperature at 3660, 4047, and 4358 A. These values were satisfactorily correlated with the extent of dissociation into NO and O atoms by means of O2 tracer techniques. On the basis of the above correlation and inert gas experiments, a general mechanism is proposed for the photolysis of NO2 from 3130 to 4047 A. Temperature effects are discussed in terms of a theoretical calculation based on the population of the rotational energy levels of NO2. This leads to a spectroscopic-photochemical determination of the dissociation energy of NO2 in good agreement with that calculated from thermodynamic data. (Author abstract)##

00939

J. J. Bufalini and E. R. Stephens

THE THERMAL OXIDATION OF NITRIC OXIDE IN THE PRESENCE OF ULTRAVIOLET LIGHT. Intern. J. Air Water Pollution, No. 9:123-128, 1965.

The kinetics of the thermal oxidation of nitric oxide in air have been studied in the parts per million range under static and dynamic conditions. The results shown that the third order rate constant for the oxidation of nitric oxide with oxygen is (1.80 plus or minus/0.21) x 10 to the fourth power L square/mole square/sec. With the presence of ultraviolet light and nitrogen dioxide, the simple third order rate expression does not adequately describe the system. A mechanism is given that describes the system under these conditions. (Author abstract)##

01026

Foote, J.K., M. H. Mallon, and J. N. Pitts, Jr.

THE VAPOR PHASE PHOTOLYSIS OF BENZENE AT 1849 A. J. Am. Chem. Soc., 88(16):3698-3702, Aug. 20, 1966. 28 refs.

The quantum yield of disappearance of benzene vapor at 1849 degrees is 0.9 plus or minus 0.3. The major irradiation product appears to be a valence isomer of benzene, tentatively identified as "benzvalene". Addition of diluent N2 reduces the rate of formation of the product but, up to 50mm total pressure, increases its maximum concentration. Small amounts of fragmentation products, i.e. methane, ethane, ethylene, and acetylene, are also observed as well as considerable amounts of polymeric or carbonaceous deposit on the cell walls. These products may be formed in the secondary photolysis of "benzvalene". (Author abstract)##

01075

A. P. Altshuller and I. R. Cohen

ATMOSPHERIC REACTIONS OF PROPIONALDEHYDE IN AIR MIXTURES. Atmos. Environ. Vol. 1(3):319-25 (May 1967.)

A type of oxidant that has not been identified previously is present in atmospheric-type systems. It has not yet been shown whether ethyl hydroperoxide or other n-alkyl hydroperoxides are th phytotoxicants formed when aldehydes are photooxidized. These experimental results suggest that aldehyde reactions can become increasingly important if atmospheric concentrations of nitrogen oxide are reduced to low levels. (Author summary modified)##

01102

J. S. Arnold, R. J. Browne, E. A. Ogryzlo

THE RED EMISSION BANDS OF MOLECULAR OXYGEN. Photochem, Photobiol., Vol.4:963-969, 1965.
CFSTI,DDC: AD 631814

The temperature dependence and the absolute emission intensity of the 6340A band of molecular oxygen have been measured. The results indicate that the emitting pair of molecules is not bound and possesses a radiative half life of about 25 msec. The implications of these results on some chemiluminescent reactions are discussed. (Author abstract)##

01318

H.J.R. Stevenson, D.E. Sanderson, A.P. Altshuller

FORMATION OF PHOTOCHEMICAL AEROSOLS. Intern. J. Air Water Pollution, Vol. 9:367-75, June 1965. (Presented at the American Industrial Association Conference, Philadelphia, Pa. April 29, 1964.)

Aerosol was produced photochemically by irradiation of a number of hydrocarbon-nitrogen dioxide mixtures, some requiring sulfur dioxide. In those reactions not requiring sulfur dioxide, its addition increased the aerosol production in most cases. Mixtures of hydrocarbons gave more aerosol than expected from their production individually. Shorter wavelength illumination had little effect indicating that sulfur dioxide activation is unimportant. The size of the aerosol depended upon the conditions of the experiment. (Author abstract)##

01579

F.C. Alley L.A. Ripperton

THE EFFECT OF TEMPERATURE ON PHOTOCHEMICAL OXIDANT PRODUCTION IN A BENCH SCALE REACTION SYSTEM. J. Air Pollution Control Assoc., Vol. 11:581-584, Dec. 1961. (Presented at the 54th Annual Meeting, Air Pollution Control Association, New York City, June 11-15, 1961.)

The tabulated results of nine irradiation runs are given for olefin and nitrogen dioxide mixtures. The oxidant production is shown as a function of time of irradiation and temperature. Oxidant production was calculated by subtracting the initial oxidant reading before the lights were turned on from the oxidant reading at the particular sample interval. The peak oxidant production was approximately doubled for each 10 degree temperature increase. The average hydrocarbon reaction rate for each four-hour irradiation period is plotted against temperature. The rate increased sharply as the reaction temperature increased from 13.5 to 25 C, then decreased slightly AS THE TEMPERATURE INCREASED TO 35.0 C. FROM THESE RESULTS IT is concluded that the peak oxidant production occurring during the irradiation of olefin and nitrogen dioxide mixtures is dependent on the reaction temperature. The magnitude of this temperature effect is of the same order as that which would be predicted for a thermal reaction.##

01680

K.W. Egger S.W. Benson

IODINE AND NITRIC OXIDE CATALYZED ISOMERIZATION OF OLEFINS. VII. THE STABILIZATION ENERGY IN THE PENTADIENYL RADICAL AND THE KINETICS OF THE POSITIONAL ISOMERIZATION OF 1,4-PENTADIENE. J. Am. Chem. Soc. 88 (2) 241-6, Jan 20, 1966.

The kinetics of the iodine atom catalyzed isomerization of 1 4-pentadiene to form 1,3-pentadiene has been studied in the gas phase over a temperature range from 129 to 241. The formation of small amounts of n-pentenes and cyclopentene does not change the basically very simple rate law for the positional isomerization of n-pentadienes which is governed by the rate of abstraction of a hydrogen atom from 1,4-pentadiene by iodine. When compared with the activation energy for the analogous hydrogen abstraction from n-pentane, assuming the activation energies for the back reactions to be equal (HI attack on pentyl and pentadienyl radicals), one obtains 15.4 plus or minus 1 kcal./mole for the resonance energy in the pentadienyl radical. This value is only 25% larger than the allyl stabilization energy. These stabilization energies are discussed in terms of a simple model of three-electron bonds and related to energies in the benzene system. (Author abstract modified)##

01787

W.A. Guillory H.S. Johnston

INFRARED ABSORPTION BY PEROXY-NITROGEN TRIOXIDE FREE RADICAL

IN THE GAS PHASE. J. Chem. Phys. 42, (7) 2457-61, Apr. 1, 1965.

In the course of studying the low-pressure thermal oxidation of nitric oxide by oxygen, a new absorption band occurring on the shoulder of the P branch of nitric oxide at 1840 cm was observed. The new absorption band was shown to be first order with respect to both nitric oxide and oxygen. The variation of this absorption band with time indicated that it was probably due to the free-radical intermediate present in this system, and was assigned to peroxy-nitrogen trioxide. The structural assignment OONO, rather than the symmetrical nitrate radical is based on the absorption frequency and by a comparison with frequencies expected for OONO and symmetrical NO_3. By assuming a value for the absorption coefficient of OONO, which is presumably formed by the rapid reversible reaction O_2 + NO equilibrium OONO, thermodynamic data concerning OONO and the equilibrium constant were estimated. (Author abstract)##

01875

M. F. Brunelle, J. E. Dickinson, and W. J. Hamming

EFFECTIVENESS OF ORGANIC SOLVENTS IN PHOTOCHEMICAL SMOG FORMATION (SOLVENT PROJECT, FINAL REPT.). Air Pollution Control District, Los Angeles County, Calif., Evaluation and Planning Div. July 1966. 188 pp.

The principal objective of this study, the determination in an environmental chamber of the smog-forming potentials of individual organic solvents likely to be emitted to the atmosphere, was accomplished and it is now possible to reach certain conclusions based on these data. By compound types, the effects to which each solvent group was found to contribute can be summarized as follows (1) Aromatic hydrocarbons, except benzene, contribute substantially to aerosol formation, rapid O_3 formation, eye irritation and total aldehyde formation. (2) Chlorinated hydrocarbons exhibit almost greater O_3 forming activity than the aromatics. Eye irritation was moderate to severe, depending upon the test conditions, and aerosol formation was negligible. On the basis of an experiment with tetrachloroethylene (8 ppm) and NO (2 ppm), alone, it is concluded that most of the activity of the mixed chlorinated solvent may be attributed to trichloroethylene. (3) Aliphatic hydrocarbons (alkanes), both high-boiling and low-boiling, contribute primarily to O_3 formation. They also produce total aldehyde concentrations comparable with those produced by irradiation of auto exhaust. The high-boiling alkanes tested tend to exhibit greater reactivity than the low-boiling materials. (4) Ketones contribute significantly to O_3 formation (0.3 - 0.4 ppm after 5 to 6 hours' irradiation) and, to some extent to eye irritation, though mostly at higher concentrations or with mixtures. As with several other solvents, aerosol formation is negligible. A single test with acetone (8 ppm) and NO (2ppm) showed little activity by this compound with respect to ozone formation or aerosol formation, and only very slight eye irritation was indicated. Data indicate that the branched ketones are considerably more reactive than straight-chain ketones. (5) Alcohols are the least active class of compounds tested.##

01878

F. Cramarossa and H. S. Johnston

INFRARED ABSORPTION BY SYMMETRICAL NO_3 FREE RADICAL IN THE GAS PHASE. J. Chem. Phys. 43, (2) 727-31, July 15, 1965.

A new infrared absorption band between 1325 and 1375 cm to the minus one power has been observed in the N_2O_5-O_3 system at low pressure in an 80-m path-length cell. In such systems the presence of the symmetrical NO_3 free radical is well known in terms of its visible absorption spectrum, which varies in the unusual way of Kss(N_2O_5) to the one third power (O_3) to the one third power. The new infrared band lies at a frequency just below that for the antisymmetric stretch of the symmetrical planar nitrate ion; the absorption optical density varies as (N_2O_5) to the one third power (O_3) to the one third power; and the new absorption has been assigned to the symmetrical NO_3 free radical. (Author abstract)##

01880

K. W. Egger and S. W. Benson

IODINE AND NITRIC OXIDE CATALYZED ISOMERIZATION OF OLEFINS. V. Kinetics of the Geometrical Isomerization of 1,3-Pentadiene, a Check on the Rate of Rotation about Single Bonds, and the Allylic Resonance Energy. J. Am. Chem. Soc. 87, (15) 3314-9, Aug. 5, 1965.

The kinetics of the nitric oxide catalyzed, homogeneous, gas phase isomerization of 1,3-pentadiene have been studied over a temperature range between 126 and 326 degrees. Analysis of the data shows that the rate-controlling step in the NO-catalyzed geometrical isomerization of pentadiene is the rotation about the single bond in the intermediate radical. Iodine is shown to form a much more stable intermediate radical, and results indicate that, in the 12-catalyzed system, the addition reaction of I atoms is rate controlling. The rotational rate constant log kc was calculated to be (11.5 plus or minus 0.3) - (5.3 plus or minus 1.0)/theta sec. compared to (11.2 - (3.8)/theta sec.) as reported earlier for the iodine catalyzed cis-trans isomerization of 2-butene. (Author abstract modified)##

01881

K. W. Egger and S. W. Benson

NITRIC OXIDE AND IODINE CATALYZED ISOMERIZATION OF OLEFINS. IV. Thermodynamic Data from Equilibrium Studies of the Geometrical Isomerization of 1,3-Pentadiene. J. Am. Chem. Soc. 87, (15) 3311-4, Aug. 5, 1965.

The measurement of equilibrium constants of the iodine-catalyzed gas phase reactions of olefins and their parent hydrocarbons has been shown to be a very simple direct, and valuable method to determine precise differences in the thermodynamic properties of the reactants. Applied to the cis-trans isomerization of 1,3-pentadiene, the present paper reports an appreciable amount of side reactions and considerable difficulties in product separation. This result is in contrast to the clean-cut experiments on the isomerization of 2-butene. The important two side reactions, the polymerization of 1,3-pentadiene and the formation of diiodide in the lower temperature range, are shown to be a consequence of the considerably more stable radical intermediate formed with 1,3-pentadiene compared to 2-butene. The NO-catalyzed system showed excellent reproducibility and no measurable side reactions. NO2 gave rise to the same difficulties obtained with the iodine catalysis. This is to be expected from the C-ONO bond strength of about 54 kcal.##

01978

A. P. Altshuller, I. R. Cohen, S. F. Sleva, and S. L. Kopczynski

AIR POLLUTION: PHOTOOXIDATION OF AROMATIC HYDROCARBONS. Science 138, (3538) 442-3, Oct. 19, 1962.

A number of aromatic hydrocarbons participate as effectively as the olefins in atmospheric photooxidation reactions in the presence of nitrogen oxides and ultraviolet light. Judged both on the basis of reactivity and concentrations in the atmosphere, the aromatic hydrocarbons cannot be ignored as contributors to the photochemical type of air pollution. (Author abstract)##

01990

A. Goetz and T. Kallai

THE SYNTHESIS OF DEFINED AEROSOL SYSTEMS. Am. Ind. Hyg. Assoc. J. 24, 453-61, Oct. 1963.

Instrumentation and procedures for the synthetic production of photochemical aerosols within a laminar airflow along a tubular channel are described. Special micro-dosimetry quantitatively facilitates continuous addition of reactive trace components (hydrocarbons, NO, NO2, SO2) and of defined nucleating particulates. The flow is subsequently irradiated symmetrically in the spectral range (320-450 millimicrons) in a special channel section without temperature increase, at adjustable intensity levels and exposure durations up to several times solar intensity at ground level. The resulting aerocolloidal components are analyzed with the Aerosol Spectrometer for determining the size and mass distribution of the photoactivated particulates at various reaction stages. Examples of smog-type reactions between traces of NO2 and olefins, and of modifications of natural aerosols, are presented. (Author abstract)##

02328

R. C. Gunton and T. M. Shaw.

AMBIPOLAR DIFFUSION AND ELECTRON ATTACHMENT IN NITRIC OXIDE IN THE TEMPERATURE RANGE 196 TO 358 K. Phys. Rev. 140, (3A) A748-A755, NOV. 1, 1965.
CFSTI, DDC AD 634223

Ambipolar diffusion and electron attachment rates were measured in nitric oxide at pressures from 0.01 to 16 Torr and at temperatures from 196 to 358 K. The gas was photoionized by single pulses of ultraviolet radiation, at and near Lyman alpha from a hydrogen lamp. Pulse lengths ranged from 10 to 300 microsec and ionization levels were kept low to reduce electron-ion recombination. Rates for the latter process are reported in a separate paper. Electron loss rates were measured by a microwave-cavity method used to record the decay following a single ionizing pulse. Ion identification was made by a mass spectrometer which sampled the ions diffusing through a small hole in the wall of the microwave cavity. Ultrahigh-vacuum techniques were used in gas purification and in production and measurements of ionization. The diffusion results are to some extent consistent with theory of diffusion of electrons and a single positive ion species in the presence of negative ions. The mass-spectrometer observations indicate that NO plus is the dominant positive ion in photoionized NO at all pressures. The principal negative ion observed with the mass spectrometer was $NO_2(-)$, and no $NO(-)$ or $NO_2(-)$ ion were detected. Direct attachment of NO_2, present as a minute impurity, seems unlikely; the $NO_2(-)$ ion may be formed by rapid charge transfer from a primary negative ion or by an attachment reaction involving rearrangement. (Author abstract modified)##

02412

A. Goetz P. Pueschel

THE EFFECT OF NUCLEATING PARTICULATES ON PHOTOCHEMICAL AEROSOL FORMATION. J. AIR POLLUTION CONTROL ASSOC. 15, (3) 90-5, Mar. 1965. (Presented at the Sixth Conference on Methods in Air Pollution Studies, Berkeley, Calif., Jan. 6-7, 1964.)

The role of nucleating particulates in the formation of photochemical aerosols was studied in a steady, laminar flow of ultrafiltered air containing NO_2 and octene-1 in the concentration range of: (30 - 170 ppm), when subjected to intense irradiation under isothermal conditions. The particulates consisted of monodisperse polystyrene latex (d equal 0.36 micron) in concentrations similar to those in the atmosphere; the irradiation intensity varied between: (6 - 40,000 lumne/liter) and the mean exposure duration between 30 - 180 sec. Samples of the flow, prior to and after its photoactivation, were withdrawn either by an Aerosol Spectrometer (AS) or by a Royco Aerosol Photometer. The photometric data include all colloidal components in the airborne state, whereas the counts obtained from the AS-deposits refer only to the nucleated latex particles. The following pattern is evident: The photochemical reaction yields fractional products (less than 3%)

which have the tendency to agglomerate (or polymerize) due to their relatively low volatility--independent of the presence or absence of nucleating particulates. The growth process appears principally different from that of fog formation by H_2O)-condensation, where, for identical supersaturation, it is inversely proportional to the nuclear concentration. In the absence of nuclei, autonucleation, i.e. self-agglomeration, occurs at a much lesser reaction rate and higher photon demand. The growth rate of the nuclei, when present, depends on the concentration of the oxidation catalyst (NO_2). Under identical conditions the mass of nuclear accumulant is directly proportional to the concentration of the reactive hydrocarbon, while the growth rate depends on the light intensity and the exposure duration. The findings indicate that density and nature of particulate matter present in an air mass prior or during photo-activation are, aside from the chemical reactant levels, of major significance in aerosol formation. (Author abstract modified)##

02508

D. G. Clifton

APPROXIMATE THERMODYNAMIC FUNCTIONS FOR THE NO_2(G) ION (TECHNICAL REPT.). General Motors Corp., Santa Barbara, Calif., GM Defense Research Labs., Aerospace Operations Calif., Defense Research Labs., Aerospace Operations Dept. May 1966. 13 pp.
DDC AD 484367

Approximate values for the free-energy function, enthalpy function, entropy, and constant-pressure heat capacity have been computed and tabulated for the temperature range from 300 K to 6000 K for the NO_2 (g) ion. (Author abstract)##

02734

PARTIAL OXIDATION PRODUCTS FORMED DURING COMBUSTION (SIXTEENTH PROGRESS REPT. JULY 1 TO DEC. 31, 1966.) California Inst. of Tech., Pasadena, Chemical Engineering Lab. 1966. 16 pp.

During the period covered by this report, primary effort was directed to the investigation of the effect of the nature of fuels upon the formation of the residual quantities of the oxides of nitrogen and upon the microscopic nature of the perturbations resulting therefrom. Tables summarize results of these studies. Table I sets forth the experimental conditions in connection with the investigation of the behavior of the propane-air and the n-butane-air system. In Table II, the composition of the reaction products of the ethane-air system propane-air and n-butane-air systems are summarized. The analysis of the perturbations in normal stress obtained in connection with the propane-air and ethane-air systems is given in Table III. Plans for continuation of these studies upon the renewal of the Public Health Service Grant No. AP-00108-08 are discussed.

02761

F.H. Reamer B.H. Sage

OSCILLATORY COMBUSTION AT ELEVATED PRESSURES. Preprint. 1966.

The effect of combustion conditions upon the magnitude of the perturbations in normal stress and in total light intensity have been investigated in a cylindrical combustor 1.0 in. in diameter and approximately 24 in. in length. The results are presented in graphical and tabular form. The quantities of oxides of nitrogen for a number of combustion conditions have been included. (Author abstract)##

02837

C. S. Tuesday

THE ATMOSPHERIC PHOTOOXIDATION OF TRANS-BUTENE-2 AND NITRIC OXIDE. General Motors Research Labs., Warren, Mich. 1961. 35 pp. (Presented at the International Symposium on Chemical Reactions in the Lower and Upper Atmosphere, San Francisco, Calif., Apr. 18-20, 1961.)

To elucidate the mechanism of the atmospheric photochemical reactions of olefins and nitrogen oxides, the reactions that occur upon the irradiation of oxygen-nitrogen mixtures containing several parts per million of nitric oxide and trans-butene-2 were investigated. Trans-butene-2 was used as a model olefin because of its symmetry and relatively rapid reaction rate. The effects of several variables on the rates of trans-butene-2 disappearance and nitrogen dioxide formation were determined together with the effect of these variables on the concentrations of reaction products. Reaction variables investigated include nitric oxide, nitrogen dioxide, trans-butene-2, and oxygen concentrations as well as light intensity and total pressure. A reaction scheme is proposed to rationalize the observed effects these reaction variables have on the rates of trans-butene-2 and nitric oxide photooxidation and on the concentrations of reaction products. The experimental results support the general conclusion that a free radical chain reaction initiated by the reaction of oxygen atoms with trans-butene-2 is very important in the atmospheric photo-oxidation of trans-butene-2 and nitric oxide.##

02838

W. A. Glasson, and C. S. Tuesday

THE ATMOSPHERIC THERMAL OXIDATION IN NITRIC OXIDE. General Motors Research Labs., Warren, Mich. 1963. 14 pp. (Presented in part at the 144th National Meeting, American Chemical Society, Los Angeles, Calif., Apr. 5, 1963.)

The kinetics of the thermal oxidation of NO in oxygen nitrogen mixtures have been determined in the parts-per-million range by long-path infrared spectrophotometry. The results of this investigation indicate that the reaction is second-order in NO, first-order in oxygen, and independent of the concentration of added NO2, with a third-order rate constant, at 23 C, of 1.57 (plus or minus .09) times 10 to the minus 9 power per (sq ppm - mn). It is concluded that the kinetics of the thermal oxidation of NO are adequately described by a simple third-order rate law and do not require the complexities suggested by Treacy and Daniels. In addition, it was found that there is no effect on the rate of the thermal oxidation due to either (a) addition of several olefins or (b) photolysis of the product NO2. (Author abstract)##

02851

E.R. Stephens

THE ROLE OF OXYGEN ATOMS IN THE ATMOSPHERIC REACTION OF OLEFINS WITH NITRIC OXIDE. Intern. J. Air Water Pollution 10, (11-12) 793-803, Dec. 1966.

The photoconversion of nitric oxide to nitrogen dioxide in the presence of olefin at low concentrations in air was studied with two objectives: (1) to test the hypothesis that oxygen atoms are the principal reagents attacking the olefin in the absence of ozone; and (2) to determine the average number of nitrogen dioxide molecules formed for each molecule of olefin consumed to see whether the conversion has the aspects of a chain reaction. On the basis of the O-atomshypothesis it is predicted that the rate of oxidation of a given olefin should be proportional to the produce of the light intensity and the nitrogen dioxide concentration. It should not be affected by the addition of a second olefin. This was found to be nearly true for a wide variety of reaction conditions. About one to two nitrogen dioxide dioxide molecules were formed for each molecule of propene oxidized.##

03020

F. Miescher

ANALYSIS OF THE SPECTRUM OF THE NITRIC OXIDE MOLECULE (FINAL SCIENTIFIC REPT.). Basel Univ., Switzerland, Inst. of Physics. (Rept. No. AFCRL-66-440) 7 pp. Mar. 31, 1966.

The experimental studies of the spectrum of the NO molecule are reviewed. A short description of the observed 3 delta states and of Rydberg-complexes is given. Problems left for future work on the NO spectrum are discussed.##

03066

D. Durant and G. R. McMillan.

ENERGY DISTRIBUTION OF PHOTOCHEMICALLY GENERATED T-PENTOXY RADICALS. J. Phys. Chem. 70 (9) 2709-13, Sept. 1966.

Previous studies on excited alkoxy radicals formed in photochemical processes were extended to the t-pentoxy species, which is well known to decompose by two parallel paths. The ratio of rate constants k sub 1/k sub 2 was estimated to be 104 at 114 degrees from experiments on pyrolysis of t-pentyl nitrite. For radicals formed by photolysis of this compound, k sub 1/k sub 2 depends strongly on the absorbed wavelength but does not reach the expected limiting value of 104 at the longest wavelength which could be studied. The dependence of quantum yields at 3660 A on pressure of an added scavenger, nitric oxide, showed that the k sub 1/k sub 2 obtained from photochemical experiments could be accounted for quantitatively by a contribution from excited radicals and a contribution identical with the ratio for unexcited radicals, obtained from pyrolysis experiments. These results provide limited justification for the "alpha method" often used in kinetic treatment of excited radical effects. Quantum-yeild measurements at high pressures of added nitric oxide suggest preferential removal of excited radicals of lower energy and disclose a broad energy distribution of the excited radicals. (Author abstract)##

03107

R.W. Boubel L.A. Ripperton

OXIDES OF NITROGEN AND UNBURNED HYDROCARBONS PRODUCED DURING CONTROLLED COMBUSTION. J. Air Pollution Control Assoc. 15, (6) 270-3, June 1965.

A diffusion flame burner was operated to determine the effect of several parameters on the quantity of NOx and unburned hydrocarbons produced. The statistical analysis indicated the unburned hydrocarbon emissions to be dependent upon the rate of heat release in the system, the amount of excess combustion air, the fuel molecular structure, and the interaction between the fuel structure, and the amount of excess air. The NOx emissions reached a maximum at the conditions which yielded minimum unburned hydrocarbon emissions. Multiple regressions were made which yielded predicting equations for both the unburned hydrocarbon and the NOx for the apparatus used. (Author abstract)##

03114

W.A. Glasson C.S. Tuesday

HYDROCARBON REACTIVITY AND THE KINETICS OF THE ATMOSPHERIC PHOTOOXIDATION OF NITRIC OXIDE. General Motors Corp., Warren, Mich., Fuels and Lubricants Dept. (Research Publication GMR-586) Aug. 15, 1966. 23 pp. (Presented at the 59th Annual Meeting, Air Pollution Control Association, San Francisco, Calif., June 20-24, 1966.)

The reactivity in the atmospheric photooxidation of NO has recently been determined for a large number of hydrocarbons. To aid in the application of these hydrocarbon reactivity measurements, the kinetics of the atmospheric photooxidation were studied. The hydrocarbon investigated covered a wide range of reactivities and structures and included: 2,3-dimethyl-2-butene, 2-methyl-2-butene, 2-methyl-1-pentene, propylene, mesitylene, and n-hexane. The rate of NO photooxidation increases less than linearly with hydrocarbon concentration for all the hydrocarbons studied. The degree of non-linearity, however, varied with hydrocarbon structure and reactivity. The effect of the NO and the NO2 concentrations on the rate of NO photooxidation also depended somewhat on hydrocarbon structure and reactivity. For all of the hydrocarbons studied, however, the NO photooxidation rate increased linearly with increased light intensity. The effect of complex hydrocarbon mixtures on the rate NO photooxidation was investigated using 3 commercial gasolines. The NO photooxidation rates measured for these mixtures agreed within experimental error with calculated rates based on chromatographic analyses of the gasolines and the reactivity in NO) photooxidation of the individual hydrocarbons in the gasolines. (Author abstract) ##

03160

K. Kimura O. Tada, K. Kumotsuki, and K. Nakaaki

ON THE GENERATION OF SULFURIC ACID MIST FROM SULFUR DIOXIDE IN THE ATMOSPHERIC AIR. J. Sci. Labour 41, (10) 510-11, Oct. 1965.

Experimental studies are reported on the simulated oxidation of sulfur dioxide in atmospheric air. It was observed that the higher the air current velocity, and the higher the relative humidity, the more marked the decrease of SO2 concentration. Sulfuric acid studies showed that it is produced by oxidation of SO2 in the air and that the coexistence of NO2, O3 or H2O2 enhances the production of H2SO4. Microscope studies of the sulfuric acid mist formed by SO2 oxidation revealed that the presence of particulate matter contributes to the formation of the acid mist. Electron microscope studies substantiated experimental results by showing that samples of city air contained particles similar to sulfuric acid mist particles obtained experimentally.##

03179

L. Spialter and J. D. Austin.

THE CLEAVAGE OF SILANES BY OXIDES OF NITROGEN. J. Am. Chem. SOC. 88, 1828, 1966.
CFSTI, DDC AD 638836

The cleavage of silanes by oxides of nitrogen is reported. Triethylsilane reacts exothermally with NO2 to yield triethylsilanol and hexaethyldisiloxane. In a separate experiment, under similar conditions, triethylsilanol readily gave the dehydration product, hexaethyldisiloxane. The silicon-silicon bond in hexamethyldisilane is also cleanly cleaved by No 2 to hexamethyldisiloxane in 95% yield. Rupture of the silicon-alkyl bond was observed when tetraethylsilane was allowed to react with NO2. The principal products obtained were hexaethyldisiloxane and acetic acid. Under similar conditions, hexaethyldisiloxane yielded hexaethylcyclotrisiloxane, octaethylcyclotetrasiloxane, and octaethyltrisiloxane. The silicon-aryl bond was also cleaved in trimethylphenylsilane by NO 2 to produce hexamethyldisiloxane and nitrobenzene. When all of the phenyl group had been removed from silicon, the vapor phase chromatogram of the crude reaction product did not show the presence of any polysiloxane components other than the disiloxane. The rate of cleavage of an ethyl group from hexaethyldisiloxane by NO2 was slow compared to that from tetraethylsilane. However, all other cleavage reactions proceeded readily and with exothermicity at room temperature to give reaction products in good (90%) yields. NOo cleaved triethylsilane to triethylsilanol at room temperature. NO also produced the silanol with complete reaction in less than 6 hr, whereas N20 gave only 10% conversion after 6 hr. It appears that the oxides of nitrogen behave similarly toward organosilanes, but with differeing degrees of activity, i.e., in decreasing order of reactivity, NOx, NO3, NO, and much slower N20.##

03349

I. C. Hisatsune.

STRUCTURES OF SOME OXIDES OF NITROGEN (SUMMARY PROGRESS REPT. OCT. 27, 1965 - DEC. 31, 1966). Preprint. Dec. 31, 1966.

The kinetic study of the third order reaction between NO and O2 was completed. Partial pressures of NO and O2 were varied from one to 200 mm and one to 470 mm respectively, and mole ratios of these reactants were chosen so that the final partial pressures of the reaction product NO2 were between one and 14 mm. Nitrogen gas was used as diluent in order to maintain essentially a constant total pressure (near 480 mm) during the reaction. The reaction was followed by recording the changes in the absorption intensity of the 1640 cm-1 NO2 IR fundamental band. Kinetic runs were made with one reactant in excess, and the resulting experimental data gave pseudo first or second order rate plots which were linear over 80 to 90 percent of the reaction. The temperature dependence of the rate constants was studied between 4 and 55 C. In this case, both the reaction cell and the reactant storage bulbs were maintained at constant temperature. From the tabulated experimental data a rate constant for this third order reaction was obtained: k = (6.18 + or - 0.20)x103 exp(+0.50 + or - 0.40 kcal/mole)/RT) liter 2 / mole 2 -sec where the estimated uncertainties are maximum errors. Kinetic studies on the NO-C12 and NO-Br2 systems were initiated. In the case of the chloride system, the reaction was found to be influenced by fluorescent light but not by the IR light source. Tentative values of the rate constant at 22.7 C were found to be 19.6 + or - 0.7 and (7.92 + or - 0.42) x 1000 liter 2/mole 2 - sec respectively for the chloride and the bromide.##

03361

B. H. Sage

FORMATION OF OXIDES OF NITROGEN DURING COMBUSTION AT ATMOSPHERIC PRESSURE. Preprint. 1966.

Experimental measurements were made of the perburbations in monochromatic and total optical intensity. Supplemental measurements of the perturbations in normal stress were made. All of the measurements were carried out at a natural gas mixture rati of approximately 0.88 stoichiometric. The composition of the products of reaction is set forth. The mole fraction of oxides of nitrogen as well as the principal components including carbon dioxide, oxygen and carbon monoxide are included. A significant variation exists in the perturbations in normal stress and in monochromatic intensity with respect to time. The perturbations in monochromatic intensity seem to undergo more variation than do the perturbations in normal stress. For the most part the frequency of the perturbations in normal stress and in monochromatic intensity, corresponding to the wavelengths of carbon dioxide and water, is substantially equal. A limited number of measurements were made in the upper part of the combust with regard to the perturbations in optical intensity. The relative magnitude was comparable to the perturbations encountered near the flameholder. Comparisons are presented of the perturbations in normal stress and the perturbations in monochromatic intensity corresponding to the emission of carbon dioxide at two different time scales. The variations in the stability of the two types of perturbations are markedly different The frequencies of these perturbations are closely allied and appear to offer credence to the assumption that they are directly related. A similar comparison is made for the perturbations in monochromatic intensity of the wavelength corresponding to the emission of water. Again, the irregularities of the fluctuations in the nature of the perturbations in monochromatic intensity, as compared to the relatively regular perturbations in normal stress, are evident.##

03428

C. S. Tuesday.

THE ATMOSPHERIC PHOTOOXIDATION OF OLEFINS: THE EFFECT OF NITROGEN OXIDES. General Motors Research Labs, Warren, Mich., 1961, 25 pp. (Presented at the Conference on Motor Vehicle Exhaust Emissions and Their Effects, Los Angeles, Calif., Dec. 5-7, 1961.) (Rept. No. GMR-355.)

The role of the oxides of nitrogen in the atmospheric photooxidation of olefins was further investigated. A previous study from this laboratory indicated, among other things, that the photooxidation of trans-2-butene was both promoted and inhibited by nitric oxide depending upon the concentration. To explain and extend this observation, the effects of various concentrations of NO2 and NO on the photooxidation rates of propylene, isobutene, trans-2-butene, and 2,3 dimethyl-2-butene were determined together with the effects of NO concentration on reaction products. The olefins investigated differed not only in photooxidation rate for a particular NO2 concentration but also in the dependence of this rate on the initial concentration of NO2. Initial increases in NO2 concentration increased the photooxidation rate of all the olefins studied. When the initial NO2 concentration was increased further each olefin behaved differently. The photooxidation rates of trans-2-butene and tetramethylethylene increased with increasing concentrations of NO up to a maximum rate. Further increases in the initial concentration of NO reduced the photooxidation rate of both these olefins. Further increases in NO concentration inhibit the olefin photooxidation rate by decreasing the concentration of ozone and the rate of the ozone-olefin reaction. The decreased rate of ozone plus olefin reaction also decreases the rate and amount of compound X formation since compound X is apparently formed by further reactions of some of the products of the ozone plus olefin reaction. The role of the oxides of nitrogen in the atmospheric photooxidation of olefins is quite complex. NO promotes or inhibits olefin photooxidation depending upon the ratio of reactants. NO2 promotes or inhibits olefin photooxidation depending both on the relative concentration of reactants and the nature of the olefin.##

03561

R. E. Pebbert.

PRIMARY PROCESSES IN THE PHOTOLYSIS OF ETHYL NITRATE. J. Phys. Chem. 67, 1923-5, Sept. 1963.

Photolysis of ethyl nitrate was conducted mainly at room temperature and at 3130 A. with conversions of approximately 0.25%. The main products for the gas phase photolysis at low conversions were ethyl nitrite, acetaldehyde, nitrogen dioxide, and oxygen. Methyl nitrite, carbon monoxide, hydrogen, nitric oxide, and carbon dioxide were minor products. No attempt was made to detect or analyze nitromethane, formaldehyde, or nitrous oxide. The peak due to nitromethane would be lost on the chromatograph in the excess ethyl nitrate peak. Nitrogen was produced but the results were not consistent. The rates of formation of methyl nitrite are not accurate and should be regarded as relative rates only. The quantum yields of ethyl nitrite and acetaldehyde formation extrapolated to zero time are 0.139 and 0.094, respectively. In the liquid phase at 0 degrees, oxygen is no longer a product. Ethyl nitrite and acetaldehyde are still the main products with small amounts of methyl nitrite. The distribution of products at low conversions is: acetaldehyde, 3.6%; ethyl nitrite, 46.0%; and methyl nitrite, 0.4%.##

03575

P. P. Austin, P. W. Lewis, and P. Donaldson, Jr.

A NEW ATMOSPHERE IRRADIATION CHAMBER. Intern. J. Air Water Pollution 4, (304) 237-46, 1961.

The irradiation of atmospheric samples of air with ultraviolet light produces oxidants when hydrocarbons and nitrogen dioxide are present and thus permits a measurement of the smog-forming potential of the air. A new high irradiation intensity chamber using fluorescent ultraviolet lamps has been developed. Data are given for the irradiation of some hydrocarbons in air in the presence of nitrogen dioxide. Some data are also given for atmospheric samples. The performance of the new chamber is compared to that of the fifty-liter chambers which have been in u in the past. The chamber volume is eight liters. Power required has been reduced from 1600 watts in the fifty-liter chamber to 160 watts. Oxidant levels produced at the same sampling rate on atmospheric samples are approximately equivalent to the levels produced in the fifty-liter chamber. (Author abstract)##

03588

G. N. Richter, H. H. Reamer, and B. H. Sage

EFFECTS OF STABILITY OF COMBUSTION ON THE FORMATION OF THE OXIDES OF NITROGEN. California Inst. of Tech., Pasadena, Chemical Engineering Lab. Aug. 30, 1960. 111 pp.

It has been established that the nitrogen oxides are undesirable products of combustion processes from the standpoint of air pollution. An investigation concerning the effect of perturbations during combustion upon the formation of the oxides nitrogen was carried out upon a premixed flame, utilizing air and natural gas as reactants. The first part consisted of reconnaissance measurements by which the effect of audible oscillatory combustion upon the residual quantities of nitrogen oxides in the products of reaction was determined. The second part comprised more carefully controlled and quantitative measurements by which the microscopic variations in conditions i the combustion zone were evaluated as a function of time and the effect of the variations upon the residual quantities of the nitrogen oxides was determined. The results indicate that perturbations in the combustion process exert a pronounced influence upon the formation of the nitrogen oxides. However, th nature of the oscillatory combustion appears sensitive to environment, and it is difficult to maintain sufficiently steady macroscopic conditions to avoid large variations with time in the microscopic perturbations. The variation in the mole fraction of nitrogen oxides in the products of reaction under carefully controlled conditions was an order of magnitude less than that encountered under the less well controlled conditions of combustion. (Author abstract modified)##

03968

Cadle, Richard D. and Margaret Ledford

THE REACTION OF OZONE WITH HYDROGEN SULFIDE. Intern. J. Air Water Pollution, 10(1):25-30, Jan. 1966. 7 refs.

The gas phase reaction of ozone with hydrogen sulfide in a mixture of oxygen and nitrogen serving as carrier gas has been investigated. The only products found were sulfur dioxide and water, and the stoichiometry corresponded approximately to the equation: H_2S plus O_3 yields H_2O plus SO_2. The reaction kinetics were investigated with a flow system, and a method was developed for titrating with nitric oxide the ozone remaining after reaction with hydrogen sulfide. The reaction has orders near zero and 1.5 in hydrogen sulfide and ozone respectively, and follows a given rate law. It is at least partially heterogeneous. The results can be used to set an upper limit for the rate of this reaction in the atmosphere. (Authors' abstract, modified)##

03969

J. G. Christian and J. E. Johnson

CATALYTIC COMBUSTION OF ATMOSPHERIC CONTAMINANTS OVER HOPCALITE. Intern. J. Air Water Pollution 9, (1/2) 1-10, Feb. 1965.

Catalytic combustion studies showed Hopcalite, an unsupported coprecipitate of copper and manganese oxides, to provide substantially complete oxidation at ca. 300 C of vapors of several types of hydrocarbons, oxygenated compounds, nitrogen compounds, and halogenated compounds. The lower molecular weight hydrocarbons proved resistant to oxidation; methane was oxidized only to the extent of 30 per cent even at 400 C. The organic nitrogen compounds produced the theoretical amount of CO2 as well as appreciable amounts of nitrous oxide (N2O). Ammonia produced 70% nitrous oxide at 315 C, and about 2% nitrogen dioxide (NO2). The decomposition of organic halogen compounds ranged from slight in the case of Freon-12 to virtually complete for methyl chloroform. In addition, new organic halides were formed by the oxidation of methyl chloroform and Freon-11. There is at least partial retention of halogen on the catalyst when Freon-114B2 and Freon-11 are decomposed. Aerosols of dioctylphthalate, a hydrocarbon-type lubricating oil, and a triarylphosphate ester lubricant were quantitatively oxidized by Hopcalite at 300 C. (Author abstract)##

04277

N. Cohen and J. Heicklen

REACTION OF NO(A2SIGMA) WITH CO2. Aerospace Corp., El Segundo, Calif. (Rept Nos. SS-TR-66-155 and TR-669(6250-40)-16.) June 1966. 25 pp.

In the presence of CO2, NO(A2Sigma+) was produced by irradiation of NO-CO2 mixtures with a cadmium arc. The products monitored were N2, whose yield dropped as the (CO2)/(NO) ratio was enhanced, and CO, whose yield rose with the (CO2)/(NO) ratio to a constant upper limit. Product formation was unaffected by temperature changes (23 to 300 C) or by the addition of xenon or NO2. The results are explained by the simple competition NO(A2Sigma+)+ NO yields N2 + other products and NO(A2Sigma+)+ CO2 yeilds NO2 & CO. Carbon dioxide is about 3.4 times more efficient than NO in the competition. (Author abstract)##

04286

K. F. Preston and R. J. Cvetanovic

ON THE POSSIBLE CONTRIBUTION OF A MOLECULAR MECHANISM TO THE PHOTODECOMPOSITION OF NITROGEN DIOXIDE. Can. J. Chem. 44, 2445-8, 1966.
CFSTI, DDC: AD 642-455

The determination of the extent of O-atom exchange during the photolysis of mixtures of NO2 and O2(36) at 2537 Angstrom units and at other wavelengths has been investigated. This method is based on the underlying assumption that only free oxygen atoms are capable of exchange with O2(36) while other potential intermediates (such as, for example, NO2) are not. The exchange reaction is therefore used as a test for the involvement of free oxygen atoms in the photolysis of NO2.##

04633

P. A. Leighton

SOME REMARKS ON THE NITRIC OXIDE -- NITROGEN DIOXIDE CONVERSION. Preprint. (Presented at the Air Pollution Research Conference on "Atmospheric Reactions," Univ. of Southern California, Los Angeles, Calif., Dec. 5, 1961.)

Nitric oxide-nitrogen dioxide photochemical conversion theory is reviewed. It has been almost universally postulated that the products of oxygen-olefin and possibly ozone-olefin reactions, which promote the above mentioned conversion, are free radicals. The extent to which these reactions produce radicals and the nature of the radicals produced in air have not been established. Other unresolved questions pertaining to this conversion reaction involve reaction kinetics and reactant concentrations.##

04653

J. M. Singer, E. B. Cook, M. E. Harris, V. R. Rowe, J. Grumer

FLAME CHARACTERISTICS CAUSING AIR POLLUTION: PRODUCTION OF OXIDES OF NITROGEN AND CARBON MONOXIDE. Bureau of Mines, Pittsburgh, Pa. (Presented at the Symposium on Combustion Reactions of Fossil Fuels, 152nd National Meeting, American Chemical Society, New York City, Sept. 11-6, 1966 and at the Basic Research Symposium, Chicago, Ill., Mar. 14, 1967.) 40 pp.

Concentrations of nitrogen oxides and carbon monoxide in combustion gases of lean, stoichiometric, and rich propane-air flames are predicted from theoretical kinetic and thermodynamic calculations. Experimental values are higher than the theoretical by factors of 2 to 7. Lowering the primary flame temperature with cold flue gas reduces the nitric oxide and increases the carbon monoxide concentrations.

Cooling rates of 5500 degrees to 10,000 degrees R/sec starting at about 3500 degrees R maintain the nitric oxide in the primary combustion zone at the initial value and do not prevent oxidation of the carbon monoxide.##

04674

D. L Bernitt, R. H. Miller, I. C. Hisatsune

INFRARED SPECTRA OF ISOTOPIC NITRYL HALIDES. Spectrochim. Acta 23A, 237-48, 1967.

The infrared spectra of nitrogen-14 Ond 15 isotopic species of nitryl chloride and fluoride were examined in the vapor and solid states. Assigments of two fundamentals in both halides were changed from those proposed by earlier investigators. A band at 1/460 cm reported earlier for the fluoride was shown to originate from an impurity. Thermodynmaic functions and new sets of force constants from both the valence and the Urey-Bradley force fields were calculated. (Author abstract)##

04870

PHOTOLYSIS OF NITRGOEN COMPOUNDS. Natl. Bur. Std. (U.S.) Tech. News Bull. 51, (4) 72-4, Apr. 1967.

In order to precisely define the amount of energy available to NO in this investigation of the photolysis of nitrogen compounds, gaseous nitrogen compounds and mixtures were irradiated with monochromatic light. Fluorescence of the excited species was obtained by passing a stream of sample gas through a reaction chamber across whichthe exciting light was directed. Reactions of a variety of mixtures and pressures of N20, NO2, NO, O2, and HN3 WERE STUDIED UNDER 0U0V RADIATION AT 12160A, A MIXTURE OF 1165 A, 1470 A and wavelenghts greater than 1600 A. 1236 and 1165 A, 1470 A and wavelenghts greater than 1600 A. Fluorescence of excited NO was obtained in beta and gamma bands corresponding to different energy levels of excited NO. The beta band of NO fluorescence was obtained by photolysis of pure N20, but was replaced by gamma-band fluorescence with the introduction of even small amounts of NO for all exciting radiations except those of wavelengths greater than 1600 A. The suggested sequence of reactions originating from N20 and the N20 and NO mixtures with the emission of beta and gamma radiation respectively are discussed. The photodecomposition of the triatomic molecules NO2 and NOC1 was studied by observations of the rotational and vibrational distribution of excited NO. In this study both beta and gamma bands were given off by NO2 subjected to the 1165 A - 1236 A mixture and to 1295 A; only the gamma bands were given off by NOC1 subjected to the same radiations.##

04878

G. N. Richter, H. C. Wiese, and B. H. Sage

OXIDES OF NITROGEN IN COMBUSTION. Premixed Flame. Combust. Flame 6, (1) 1-8, Mar. 1962.

This investigation was undertaken to determine the effect of combustion conditions in premixed flames upon the formation of the oxides of nitrogen. Measurements were made of the residual quantity of the oxides of nitrogen in samples taken as a function of the spatial position in a cylindrical combustor. The influence of mixture ratio and of rate of flow of the reactants for a premixed, natural gas-air flame was studied. In addition the apparent temperature and mole fraction of carbon dioxide, oxygen and carbon monoxide were determined as a function of spatial position in the combustor. It was found that the local perturbation of pressure encountered in the combustion was one of the principal factors in increasing the residual quantities of oxides of nitrogen in the products of reaction. The results are presented in graphical and tabular form.##

04913

J. B. Olin and B. H. Sage

AN EXPERIMENTAL STUDY OF THE FORMATION AND DECOMPOSITION OF NITRIC OXIDE. J. Chem. Eng. Data 5, (1) 16-20, Jan. 1960.

The experimental conditions for each of 65 tests upon the nitrogen-oxygen system and the initial and final compositions for the 65 tests are tabulated. The influence of the maximum apparent temperature upon the residual nitric oxide ratio is indicated schematically for compositions containing 0.4 mole fraction nitrogen, 0.2 mole fraction oxygen, and 0.4 mole fraction helium. A markedly higher nitric oxide ration for the same maximum apparent temperature was found for the tests in which the light piston was used (initial sample pressure of approx. 1.16 p.s.i.). Data for an initial sample pressure of approximately 4.62 p.s.i. shows much less, if any, difference between the behavior with the light and the heavy piston. Variation in the nitrogen-oxygen ratio had relatively small influence upon the relationship of the residual nitric oxide ratio to the maximum apparent temperature. Approach to chemical equilibrium in the ballistic piston was established from a series of tests made with the piston weighing 3.29 pounds. Measurements were made upon mixtures which contained equal mole fractions of nitrogen and oxygen with 0.8 mole fraction helium and mixtures which contained 0.2 mole fraction nitric oxide with 0.8 mole fraction helium. The residual nitric oxide ratio resulting from the nitric oxide-helium sample decreased with an increase in the maximum apparent temperature. On the other hand, the residual nitric oxide ratio in the mixture of nitrogen and oxygen increased with an increase in the maximum apparent temperature.##

04914

R. R. Sakaida, R. G. Rinker, Y. L. Wang, and W. H. Corcoran

CATALYTIC DECOMPOSITION OF NITRIC OXIDE. A.I.Ch.E. (Am. Inst. Chem. Engrs.) J. 7, (4) 658-63, Dec. 1961.

Catalytic decomposition of nitric oxide at a concentration of 0.404 and 0.432% by volume in nitrogen was studied in a tubular flow reactor. The packing consisted of alumina pellets impregnated with 0.1% by weight of platinum oxide and 3.0% by weight of nickel oxide. Tests were conducted at pressures of 1 to 15 atm. and temperatures from 800 to 1,000 F. A rate equation correlating the data as a function of temperature, pressure, and compositions was developed. A reaction mechanism compatible with the rate equation is proposed. The rate of the heterogeneous decomposition of nitric oxide over a platinum-nickel catalyst supported on activated alumina was found to be second order with respect to nitric oxide, retarded by atomic oxygen, and further retarded by the excess nitrogen in the system. The rate equation is applicable for the decomposition of nitric oxide present in nitrogen at concentrations of less than 0.5% within the temperature range of 800 to 1,000 F. and a pressure range of 1 to 15 atm.##

04920

G. N. Richter, H. H. Reamer, and B. H. Sage

OXIDES OF NITROGEN IN COMBUSTION (EFFECTS OF PRESSURE PERTURBATIONS). J. Chem. Eng. Data 8, (2) 215-21, Apr. 1963.

Experimental information was obtained concerning the residual quantities of the oxides of nitrogen under conditions of oscillatory combustion. Results indicated a marked variation in behavior with change in mixture ratio. The frequency of the oscillations shifted significantly from one regime to another in the vicinity of a stoichiometric mixture ratio. The quantities of oxides of nitrogen changed from 2 to more than 60 X .000001 mole fraction with a change in mixture ratio. (Author abstract)##

04921

G. N. Richter, H. C. Wiese, and G. H. Sage

OXIDES OF NITROGEN IN COMBUSTION (TURBULENT DIFFUSION FLAME). J. Chem. Eng. Data 6, (3) 377-84, July 1961.

The influence of mixture ratio and level of turbulence upon the macroscopic nature of the combustion process was studied. Particular emphasis was placed upon the formation of oxides of nitrogen. The combustion tube was 3.826 inches in inside diameter and approximately 162 inches long. A cooling jacket-surrounded the tube and sampling ports were located along its side. A flow of air at the desired rate was initiated, after which a flow of natural gas was introduced and adjusted to the desired rate. Combustion was initiated by an electric spark located just above the turbulence grid. Studies were made at the level of turbulence realized in the free stream of air and natural gas, and at three levels of turbulence induced by three sets of grids. Carbon dioxide, carbon monoxide, and oxygen were determined by conventional Orsat methods. Oxides of nitrogen were determined by a phenoldisulfonic acid method. Mixture ratio exerts a pronounced influence upon the formation of the oxides of nitrogen, and a mixture ratio between 80 and 100% corresponds approximately to the maximum quantity of the oxides of nitrogen in the products of reaction. Perturbation, maximum temperature, approach to equilibrium, and inhibiting effects of carbon monoxide all appear to be important in establishing the formation of the oxides of nitrogen.##

04992

A. J. Haagen-Smit, C. E. Bradley, M. M. Fox

FORMATION OF OZONE IN LOS ANGELES SMOG. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 54-6.

When bent pieces of rubber were exposed to sunlight in the presence of oxygen and nitrogen dioxide no cracking took place. Rubber cracked in nitrogen dioxide in air but not when the air was filtered through charcoal. Rubber cracked in 3-methylheptane and NO2 in air but not when either was used alone; it cracked when introduced to a mixture exposed to sunlight for several hours. Ozone was identified as the rubber-cracking material. Rubber cracked in some organic acids photooxidized with NO2 in air; ozone was again isolated and identified. Rubber cracked in gasoline photooxidized with NO2 in air. Ozone formed when 4-n-nonene was photooxidized with NO2 in air. Biacetyl in air cracked rubber when exposed to sunlight; ozone was identified. Rubber also cracked with biacetyl and NO2 in air. Rubber cracked in butyl nitrite in air exposed to sunlight. The concentrations of the organic materials and of NO2 were of the same order as those found in Los Angeles smog.##

05204

M. Nicolet

NITROGEN OXIDES IN THE CHEMOSPHERE. Pennsylvania State Univ., University Park, Dept. of Electrical Engineering. Dec. 10, 1964. 32 pp. (Scientific Rept. No. 227.) (Rept. No. AFCRL-64-939.)

A study is made of the various reactions in which nitrogen oxides are involved in the chemosphere. The hydrogen compounds do not play an important role, and it is found that the essential aeronomic reactions depend on ozone and atomic oxygen. Thus, the ratio nitrogen dioxide-nitric oxide can be determined. The absolute values of the NO2 and NO concentrations depend on the dissociation of molecular nitrogen in the chemosphere. The chemical conditions cannot be applied in the mesosphere since the life-time of NO is relatively long, and a downward transport is involved. Very special assumptions concerning chemical reactions would be necessary to reconcile the photochemical picture and the observational results. The introduction of ionic reactions, considered in an accompanying paper, will lead to a correct interpretation. (Author abstract)##

05226

E. Ferht, and P. A. Back

THE REACTION OF ACTIVE NITROGEN WITH MIXTURES OF ETHYLENE AND NITRIC OXIDE . Can. J. Chem. 43, 1899-904, 1965. (Presented at the Annual Conference, Chemical Inst. of Canada, Kingston, June 1964, N.R.C. No. 8406.)

The reaction of active nitrogen, produced in a condensed discharge at 1 mm pressure, with mixtures of ethylene and nitric oxide has been studied with mixtures ranging in composition from pure ethylene to pure nitric oxide. The sum of HCN + 14N15N produced from mixtures of C2H4 and 15NO remained constant and equal to the HCN produced from pure C2H4 for NO concentrations up to 50 mole %. As more NO was added, this sum rose towards the value of 14N15N produced from pure 15NO. These data appear to lend support to the HCN yield from ethylene as the true measure of nitrogen atom concentration. It is suggested that 15NO also undergoes a concerted reaction with excited 14N14N molecules, to produce 14N15N, and that these excited molecules can quenched by collision with ethylene or methane without consuming nitrogen or forming HCN. (Author abstract)

05267

H. A. Taylor, and D. S. Sethi

NITRIC OXIDE PHOTOLYSIS (FINAL REPT.). New York Univ., p8n.y. (Aug. 31, 1965.) 4 pp. (Rept. No. CP 68048.).

An Aerograph gas chromatograph was used with a millivolt range recorder. The absorbent was a six inch column of silica gel, used at room temperature with helium as the carrier gas at flow rates in the range of 60-65 ml/min. Samples were injected using a gas-sampling value connected directly to a vacuum system, pressures being measured on an octoil manometer. In elution, N2, NO and NO2 were removed in the first ten minutes and N2O around twenty minutes. The NO and NO2 peaks were not always separable, the one appearing as a shoulder on the other peak at some concentrations but the retention of the N2O permitted easy separation and therefore recognition. By calibrating standard mixtures of N2, NO, NO2 and N2O, a lower limit for the detection of N2O was established at 10 to the-8th power mole. Some twenty photolyses of NO at 1470 A were made and the products analyzed by the new procedure. None of these showed any N2O. Since there appeared to be some small variation in the retention time of N2O from sample to sample of the calibrating standards, the photolysis product analysis was sandwiched between two standard runs. No N2O peak appeared. In an effort to

increase the concentration of NO2 with which N atoms might react during photolysis, small amounts of oxygen were added to the NO before photolysis. Still no N2O could be found. Finally, small amounts of N2O were added initially to the NO and the mixture photolyzed at 1470 A. The products after the run contained no N2O. It is apparent that during the period of the photolysis any N2O that might be produced was decomposing. It is to be concluded that the N2O, suspected in the earlier work reported in the accompanying reprint, was actually CO2 and that under the experimental conditions with a duration of photolysis of from 15 to 20 minutes no N2O is present among the final products. While definitely answering the question of the presence of N2O in the system studied earlier, it must be realized that another question is posed in its place, namely, if the duration of the photolysis were shortened, could N2O be found among the products before its decomposition. To investigate this, as well as to attempt to answer the question of the effect of a change in the duration of photolysis, a research assistant has undertaken as his doctoral problem, NO photolysis at 1470 A by a flow method.#
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05286

J. P. Devlin, and I. C. Hisatsune

UREY-BRADLEY POTENTIAL CONSTANTS IN NITROSYL AND NITRYL HALIDES. Spectrochim. Acta. 17, 206-17, 1961.

The Urey-Bradley force field has been used to calculate the vibrational force constants in NOF, NOCl, NOBr, NO2F and NO2Cl. Refined force constants using harmonic frequencies of NOCl and NO2 molecules containing isotopic nitrogen atoms have also been evaluated. The transfer of Urey-Bradley force constants from N2O4 and NOX ro NO2X yielded reasonably good results except for the N - F stretching mode in NO2F. For the nitryl fluoride a possible change in assignment is suggested from the present calculations. (Author abstract)##

05288

I. C. Hisatsune, and K. H. Rhee

THE INFRARED SPECTRUM OF N2O3. (In: Advances in Molecular Spectroscopy.) Proc. Fourth Intern. Meeting of Molecular Spectroscopy, 1959. 3, 989-98, 1962.

The infrared spectrum of a mixture of N2O3 and N2O4 was studied in the liquid phase from 2 to 25 microns and in the solid phase from 2 to 35 microns, both at low temperatures. By comparing this spectrum with that of pure N2O4 in the same phases, absorption bands belonging to N2O3 were identified. A tentative assignment of all but three of the fundamental vibrations in N2O3 is presented. (Author abstract)##

05289

I. C. Hisatsune, J. P. Devlin,

INFRARED SPECTRA OF SOME UNSTABLE ISOMERS OF N204 AND N203.
J. Chem. Phys. 33, (3) 714-9, Sept. 1960.

The temperature dependence of the infrared spectra of N204 and N203 in the solid phase at liquid-nitrogen temperatures has been investigated. From these spectra of both 14N and 15N isotopic molecules, absorption bands which may be assigned to unstable isomers of these nitrogen oxides have been identified. A reasonable interpretation of these absorption bands can be made by assuming the existence of two unstable forms of N204 and one of N203. (Author abstract)##

05290

I. C. Hisatsune

THE ASSIGNMENT OF THE N204 SPECTRUM. (In: Advances in Molecular Spectroscopy.) Proc. Fourth Intern. Meeting of Molecular Spectroscopy, 1959. 3, 982-8, 1962.

Results from recent investigations of the infrared and Raman spectra of N204 in the liquid and solid phases at low temperatures are presented and discussed. An assignment of the fundamental modes is made and with this the heat capacities of the solid from 20 to 262 K (the melting point) and the entropy of the solid at the m. p. have been calculated. These calculations agree well with the experimental values. A normal coordinate calculation using a modified valence force field has been attempted and these results are discussed. (Author abstract)##

05425

Shaw, R., F. R. Cruickshank, and S. W. Benson

THE REACTION OF NITRIC OXIDE WITH 1,3- AND 1,4-CYCLOHEXANDIENES. J. Phys. Chem., 71(13):4538-4543 Dec. 1967. 16 refs.

The gas-phase reactions of nitric oxide with 1,3- and 1,4-cyclohexadiene have been studied in a Pyrex reaction vessel between 306 and 359 deg. Initial pressures were varied: 1,3-CH, 3-57 torr; 1,4-CH, 10-71 torr; and NO, 64-436 torr. No pressure change could be detected. Products identified by gas chromatography and mass spectrometry were water, nitroux oxide, benzene, and traces (about 10% of the benzene) of cyclohexene. Good mass balances were obtained for the hydrocarbons, but the water analyses were erratic and the nitrous oxide was less than given by the stoichiometric equation. The rate of production of benzene was unaffected by increasing the surface to volume ratio 20 times and was first order in cyclohexadiene and nitric oxide. The rate-determining step is given. (Authors' abstract, modified)##

05611

S. W. Nicksic, J. Harkins, and B. A. Fries

A RADIOTRACER STUDY OF THE PRODUCTION OF FORMALDEHYDE IN THE PHOTO-OXIDATION OF ETHYLENE IN THE ATMOSPHERE (PART II--THE EFFECT OF OTHER COMPOUNDS ON YIELD AND CONVERSION). J. Air Pollution Control Assoc. 14, (6) 224-8, June 1964.

In this study, the tracer procedure was used to study some aspects of the effect of composition of the irradiated mixture on the amount of formaldehyde produced from ethylene, the latter being the dominant olefin in auto exhaust. The irradiation chamber contained oxidants, NO_2, CH_2O, hydrocarbons and aerosols. Oxidant, nitrogen dioxide, and aerosols were measured in order to obtain a more complete monitoring record of the reaction. Chemical formaldehyde and radiochemical formaldehyde measurements together with gas chromatographic determination of hydrocarbons, were used to establish yields and conversion. Results showed: (1) Ethylene gives more formaldehyde in the presence of oxygenates and certain aromatics because the reactions are faster; the fraction converted, however, remains constant. The quantitative aspects of the effect of oxygenates remain to be studied. (2) Formaldehyde yield from ethylene irradiated alone depends on the nitric oxide-hydrocarbon ratio. (3) In the presence of other olefins, the nitric oxide dependency is much less. (4) Production of formaldehyde from ethylene is not influenced by other olefins except for the nitric oxide effect. In reference to changing composition of exhaust, oxygenates can be expected to increase formaldehyde formed during photo-oxidations, but it is not yet possible to state how big the effect might be. The removal of olefins will probably affect formaldehyde production in proportion to the extent of removal. Removal of other olefins will not affect the reactions of ethylene per se except for the nitric oxide-hydrocarbon ratio effect.##

05613

Levine, M., W. F. Hamilton, and E. Simon

ATMOSPHERIC PHOTOCHEMICAL REACTIONS OF HALOGENS AND BUTYL HALIDES. J. Air Pollution Control Assoc., 14(6):220-223, June 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Assoc., Detroit, Mich., June 9-13, 1963.)

This investigation was oriented toward delineation of the interactions involved in the chemical inhibition of smog exhibited by iodine and to a much lesser extent by the other halogens. Apparatus used for handling and irradiating polluted atmospheric air was a 500 cu ft chamber enclosed by a "Mylar" polyester film 1 ml thick. The chamber is mounted on large casters allowing positioning of the unit for optimum sunlight exposure. When thermal (dark) reactions are studied, the entire chamber is rolled into a large, light tight, thermostatically controlled oven. Other details concerning the laboratory procedure are given. The results of these tests show that neither temperature, over the range of about 100 to 200 F, nor sunlight greatly influences the reaction ratio of O_3 with iodine 2, and that sunlight has a much greater effect on the reaction rates of the halogens with O3 than does temperature. The qualitative rates of halogen-ozone reactions in purified air in sunlight are iodine 2 greater than Br2 greater than Cl2. The effectiveness of iodine 2 in reducing O3 in a smoggy atmosphere is enhanced over its effect on O3 in purified air, whereas the effectiveness of Br2 and Cl2 in quenching smog O3 is diminished. The effectiveness of Br2 in reducing O3 is inhibited by the presence of both saturated and unsaturated hydrocarbons, whereas the iodine 2 - O3 reaction is unaffected.##

05628

E. Briner, W. Pfeiffer, and G. Malet

A CONTRIBUTION TO THE STUDY OF PEROXIDATION OF NITROGEN OXIDE-III (THE INCREASE IN THE SPEED OF NITROGEN OXIDE PEROXIDATION AT VERY LOW TEMPERATURES). J. Chim. Phys. (Paris) (Translated as JPRS R-8527-D.) 21, 25-44 (1924). Fr. (Tr.)

The process of peroxidation of nitrogen oxide, whose speed increases as the reaction temperature drops, is a purely chemical process in flat contradiction with the general rule that the speed of a reaction increases with the rise in temperature. A systematic study of this phenomenon, measuring the reaction speed at increasingly low temperatures was conducted. By means of suitable apparatus and operating methods, the process of peroxidation over a temperature range from plus 75 deg. to minus 190 deg., was observed. For various temperatures within that range, the absolute constants of speed as well as the temperature coefficients were determined. To show clearly the influence of temperature as it occurs in practice on nitrous gases, whose composition is generally given in percentages of NO by volume, the values for the relative constants and the half-reaction times for various temperatures above and below 0 deg were calculated. The half-reaction times are particularly interesting to consider, since because of the formation of N2O3 they indicate good conditions for recovering nitrous mixtures. To bring out the effect of refrigeration at minus 183 deg. and for a mixture containing 1% NO in air, a mixture about the same as the gas from an arc furnace, the half-reaction time is 58 times shorter than at ordinary temperatures. Intense refrigeration of the nitrous gases will thus make it possible to reduce the volume of oxidation chambers by very large proportions.##

05643L

H. H. Reamer

PARTIAL OXIDATION PRODUCTS FORMED DURING COMBUSTION. Preprint. 1966.

During the period covered by this report, primary effort was in the investigation of the effect of the fuel employed upon the characteristic perturbations and the residual quantities of the oxides of nitrogen. The experimental conditions encountered in connection with the investigation of the behavior of the propane-air and the n-butane-air system are given. The average reaction pressure was approximately 41 p.s.i.a. The composition of the products of reaction for the ethane-air, propane-air, n-butane-air and natural gas-air systems are tabulated. All the measurements involving natural gas-air, ethane-air, propane-air and n-butane-air, were carried out at a stoichiometric mixture ratio of approximately 0.93. Variation in the perturbations of normal stress and the frequency, as a function of the molecular weight of the fuel are reported. The quantities of residual oxides of nitrogen increased rapidly with an increase in molecular wt from that of the natural gas-air system to that of the ethane-air system and progressively increased with further increases in molecular wt. to propane and n-butane. On the other hand, the perturbations in the double amplitude of the normal stress decreased progressively with an increase in molecular wt. of the fuel. Phase relationships between the upper and lower ports were almost exactly 180 degrees. The frequency was approximately 509 cycles per sec in the case of the natural gas-air system. An increase to 521 cycles per sec was found for the ethane-air system and a small decrease to 518 and 516 cycles per sec for the propane-air and the n-butane-air systems respectively was observed. The analysis of the perturbations in normal stress obtained in connection with the propane-air and ethane-air systems is included. It is apparent, as in the case of the ethane-air system, that a phase relationship slightly reater than 180 degrees exists between the upper and lower ports, again confirming that the primary nature of the perturbations involved a longitudinal wave.##

05824

L. G. Wayne

ON THE MECHANISM OF PHOTO-OXIDATION IN SMOG. Preprint. (Presented at the Joint Research Conference on Motor Vehicle Exhaust Emissions and Their Effects, Los Angeles, Calif., Dec. 5, 1961).

The action of sunlight on urban atmospheres contaminated with auto exhausts promotes oxidation of hydrocarbons and NO and eventual accumulation of O3. Some very intriguing problems of chemical mechanisms are presented by these reactions. It is the purpose of this paper to subject to an elementary kinetic analysis some of the proposed reaction schemes and to introduce a mechanism which shows promise of explaining certain features of the photooxidation process. Experiments have established that the oxidant material is mainly O3. The various hydrocarbons present in automobile exhaust disappear at different rates; olefins in general react more rapidly than paraffins, and most olefins react more rapidly than ethylene, which is the predominant olefin in auto exhaust. Relevant information available from experiments involving the irradiation of synthetic atmospheres containing low concentrations of hydrocarbons and oxides of nitrogen has presented reasoning leading to the conclusion that react chains are very probably involved in these systems. Briefly, the reasoning is that, since NO2 is the only likely primary absorber of actinic light products, hydrocarbons are probably involved by reaction with the oxygen atoms produced in the photolysis of NO2; but since the rate of accumulation of products is sometimes faster than the estimated rate of reaction between hydrocarbon molecules and oxygen atoms, each appropriate oxygen atom collision must lead to several subsequent steps, i.e., to a chain of reactions. Such a chain might promote the conversion of NO to NO2 in either of two ways: by direct consumption of NO, or by consumption of molecular oxygen to form O3. Kinetic implications of chain mechanisms of 3 different types of examined: (1) A mechanism offered by Saltzman, in which chains are initiated by free radicals formed in a hydrogen abstraction reaction by oxygen atoms; (2) A scheme suggested by Leighton incorporating some suggestion of Schuck and Doyle; (3) A new hypothetical mechanism, serving to illustrate the possible consequences of a chain-branching step. Further study, particularly of the relative rates of photooxidation of nitric oxide and olefins in systems with very little nitrogen dioxide, should provide evidence bearing on the importance of branching chains in the urban photochemical smog system.##

06320

E. S. Fishburne, D. M. Bergbauer, R. Edse

THE CATALOYTIC DECOMPOSITION OF NITROUS OXIDE AND THE THERMAL DECOMPOSITION OF NITROGEN DIOXIDE. Ohio State Univ., Columbus, Aeronautical and Astronautical Research Labs. (Aug. 1965). 35 pp. (Rept. ARL 65-169.) (Contract AF 33(657-8951.) (Project 7065.)
CFSTI, DDC: AD 622692

The reaction between atomic oxygen and N2O has been studied at temperatures ranging from 1500 to 2100 K. The atomic oxygen in this study was generated by either the thermal decomposition of NO2 or the thermal decomposition of ozone. To determine the amount of atomic oxygen released in the thermal decomposition of NO2 it was necessary to study this decomposition in detail. This study was conducted also at temperatures ranging from 1500 to 2000 K and over a wide range of concentrations and pressures. The reaction rates obtained for the various steps in the decomposition of NO2 are in general agreement with those obtained by other investigators. The reaction of nitrous oxide in the presence of NO2 with Ar as the diluent was studied to determine if the oxygen released in the decomposition of NO2 would accelerate the decomposition of N2O. No noticable acceleration was observed. Many experiments were conducted with a N2O mole fraction of 0.02 and O3 mole fractions varying between 0.005 and 0.06. In these experiments the diluent was molecular oxygen. The presence of atomic oxygen definitely produced an increase in the rate of decomposition of N2O. It is found that the reaction between atomic oxygen and N2O is pressure dependent. It is shown that the different rate constants obtained by other investigators may be reasonably explained on the basis of a pressure dependent step in the reaction mechanism. (Author abstract)##

06473L

Bonner, B. H.

REACTION RATE DATA FOR SOME NITROGEN/OXYGEN SPECIES. Rocket Propulsion Establishment, Westcott, England, RPE-TM-425,

24p., 1966.
DDC: AD808585

Reaction rate data for sixteen gas phase reactions involving species composed of nitrogen and oxygen are presented. The sources of the data presented in each table are given as references, together with brief indications how the data were obtained.

06471

N. P. Carleton

STUDIES OF METASTABLE MOLECULES OF ATMOSPHERIC INTEREST (FINAL REPT. JUNE 1, 1964-AUG. 31,1966). Smithsonian Astrophysical Observatory, Cambridge, Mass. (Oct. 1966). 52 pp. (Rept. No. AFCRL-66-717.)
CFSTI, DDC: AD 642 851

The work described in this report has focused on the study of metastable states of atoms and molecules of atmospheric interest. The technique was to form a thermal molecular beam and produce metastables in the beam by electron bombardment. The metastables drifted along with the beam, and were observed to decay in flight, to collide with other molecules in a low pressure gas cell, and to strike metal surfaces (with subsequent ejection of electrons). The following observations were made: (1) N2 metastables excite the gamma bands of No with a rate of about 1% of the momentum-transfer collision rate, populating only low vibrational levels. (2) A long-lived O2 metastable state around 10.8 ev reported by others apparently does not exist (but rather belongs to impurities in the O2). (3) Long-lived metastable molecules can effuse directly from a region containing a short duration (a few msec) afterglow of N2 and (4) Excited N2 molecules can maintain their excitation after collision with a teflon surface, with a reflection coefficient of 40% + or- 20%. A theoretical estimate of the mode of decay of long-lived metastables shows that electric dipole radiation resulting from spin-orbit coupling will almost always dominate magnetic quadrupole radiation. (Author abstract modified)

06698

R. W. Hurn, B. Dimitriades, and R. D. Fleming

HOW HYDROCARBON TYPES DETERMINE SMOG-FORMING POTENTIAL OF EXHAUST GASES. S.A.E. (Soc. Automot. b8eng.) J. 74 (2), 59-61 (Feb. 1966).

Relationships between automobile exhaust gas reactivity under irradiation and composition of unburned hydrocarbons in the exhaust was studied over a wide range of fuels and driving conditions. Indices measured were: rate at which NO is converted to NO2; oxidant formation; and formaldehyde formation. These were correlated with concentrations of: unsaturates plus oxygenates; non-aromatic unsaturates plus oxygenates; and non-aromatic unsaturates plus oxygenates, less acetylene and propylene. Correlation between composition and chemical reactivity is not consistent. Oxidant formation is constant within experimental error limits. Variability in the rate of NO2 formation is considered to be due to variations in composition, including variations in molecular weight, within each of the general classifications with which reactivity correspondence was sought. Inherently low precision of the analytical method may be at fault for the + or - 34% scatter shown in formaldehyde-formation data. For exhaust samples of similar origin (that is, the same fuel), a fairly well defined correlation exists between reactivity and composition. Extracting all or part of the unsaturates and oxygenates from exhaust samples does tend to reduce their reactivity. Nitrogen oxides also play a complex role in determining reactivity. In a hydrocarbon-nitrogen oxides mixture, reactivity is more or less a monotonic function of the hydrocarbon concentration, but its dependence on nitrogen oxides is not monotonic. Comparing the reactivity of two exhaust samples , therefore, means taking account not only of reactive hydrocarbon concentrations, but also their ratios to nitrogen oxides, as well as the direction in which the hydrocarbon to nitrogen oxides ratio affects reactivity.##

07449

B. H. Sage

FORMATION OF OXIDES OF NITROGEN DURING COMBUSTION AT ATMOSPHERIC PRESSURE (FIFTEENTH PROGRESS REPORT: JANUARY 1 TO JUNE 30, 1967). Preprint, California Inst. of Tech., Pasadena, Chemical Engineering Lab., ((24))p., 1967. 5 refs.

Experimental results showed that it was not necessary to make any significant modifications in the combustor used for this investigation. The transducers with the flame shields removed have been found to function satisfactorily at a large number of ports which are located in the walls of the combustor. A reflecting disk mounted on a rod was lowered into the combustor. Provisions were made for movement of the reflecting disk to different positions along the combustor at distances from about 60 to 90 inches above the flameholder. The experimental program was directed to an understanding of the longitudinal resonant phenomenon which appeared to be rather complicated. The perturbations in radial stress and frequency were determined at ports 12.7, 22.7 and 76:7 inches from the flameholder for a relatively large number of positions of the reflecting disk. Diagrams of the equipment used are shown. Experimental conditions and results of analysis of the perturbations in radial stress and frequency are presented in tables, along with other measurements.##

07450

Sage, B. H.
PARTIAL OXIDATION PRODUCTS FORMED FURING COMBUSTION(

PARTIAL OXIDATION PRODUCTS FORMED DURING COMBUSTION (SEVENTEENTH PROGRESS REPORT: JANUARY 1 TO JUNE 30, 1967). Preprint, California Inst. of Tech., Pasadena, Chemical Engineering Lab., ((31))p., 1967.

The monochromator and collimator employed in the atmospheric combustor, reported under the 15th progress report have been adapted to the pressure combustor. Results obtained after changes are reported. Tables and diagrams are presented.##

07681

Fontijn, Arthur and Daniel E. Rosner

NO + O CHEMILUMINESCENT REACTION USING ADIABATICALLY EXPANDED NITRIC OXIDE. Virginia Univ., Charlottesville, Dept. of No. NR- -,,Technical Rept. No. AC-6-P, 7p., Jan. 1967. 18 refs.
CFSTI, DDC: AD 647978

The rate constant for the chemiluminescent reaction NO + O yields NO2 + hv has recently been observed from upper-atmospheric chemical releases and simulated releases in a low-density wind tunnel to be several orders of magnitude higher for adiabatically expanded than for "normal" NO. In this note, it is shown that this enhancement can be attributed to the presence of clustered NO based on super saturation calculations and recent mass spectrometric gas-sampling data. These clusters allow the normal three-body excitation step to be replaced by a two-body step for which the observed rate constant is shown to be quite reasonable. (Authors' abstract, modified)

07771

Hedley, A. B.

FACTORS AFFECTING THE FORMATION OF SULPHUR TRIOXIDE IN FLAME GASES. J. Inst. Fuel, 40(315):142-151, April 1967. 48 refs.

The formation of sulphur trioxide within flame gases not due to catalytic oxidation by stationary surfaces over which the gases pass is discussed. Thermodynamic considerations are briefly presented as well as a discussion of previous work on sulpjur trioxide formation in flames which is divided into enclosed and unenclosed flame studies. In a section on the kinetics and mechanisms involved, the role of oxides of nitrogen as a homogeneous catalyst, and airborne ash particles as a heterogeneous catalyst, are discussed. The importance of residence time and temperature of gases in combustion appliances is emphasized and the paucity of information available on suitable reaction rate data is indicated.

08845

Altshuller, A. P., S. L. Kopczynski, W. A. Lonneman,
T. L. Becker, and D. Wilson

PHOTOOXIDATION OF PROPYLENE WITH NITROGEN OXIDE IN THE PRESENCE OF SULFUR DIOXIDE. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, ((10))p., ((1967)). 13 refs.

The photooxidation of 2 ppm of propylene and 0.5 ppm of nitrogen oxide was investigated under dynamic flow conditions with sulfur dioxide present in the reaction mixtures at concentrations from 0.0 to 1.2 ppm. Application of the statistical 't' test showed no significant differences in rates of consumption of propylene and nitrogen oxide or in yields of oxidant, peroxyacetyl nitrate, formaldehyde, and acetaldehyde among tests at the various levels of sulfur dioxide, including zero ppm. Amounts of sulfur dioxide consumed in the reactions ranged from 25 to 60%. Although a sulfur balance was not obtained, appreciable amounts of sulfate were measured as a product of the oxidation of the sulfur dioxide. On the basis of previous investigations, the sulfate is believed to be present as sulfuric acid aerosol. These results suggest that appreciable levels of oxidant may occur in urban atmospheres even when high concentrations of sulfur dioxide are present. (Authors' abstract)##

09046

Sage, B. H.

PARTIAL OXIDATION PRODUCTS FORMED DURING COMBUSTION. (EIGHTEENTH PROGRESS REPORT: JULY 1 TO DECEMBDR 31, 1967.) Preprint, California Inst. of Tech., Pasadena, Chemical Engineering Lab., ((65))p., 1967. ((21)) refs.

The modifications in the pressure combustor were found to function satisfactorily and have permitted measurements of both the perturbations in normal stress and the perturbations in total and monochromatic optical intensity. Experimental activities have been limited primarily to obtaining information concerning the perturbations in total and monochromatic optical intensities utilizing air and natural gas as fuel. Results are presented in several tables. To more fully explain the behavior in the pressure combustor, a set of routine computer programs to permit the prediction of the composition of the products of reaction for any mixtures of air and any hydrocarbon was completed. The calculations have been carried out for varying rates of heat loss from the combustor. The exit temperature from the combustor was computed in this fashion. It was also computed from the rate of flow of gas through the converging-diverging nozzle at the exit of the combustor. Rather good agreement was obtained between these widely different means of evaluating the exit temperature. The complicated behavior of the perturbations in normal stress at the two ends of the combustor is depicted. The behavior depicted can be explained by the difference in temperature at the two ends of the combustor and the markedly greater radial temperature distributions near the exit of the combustor. Furthermore, the velocity of wave propagation is somewhat different at the same point in the combustor depending on the direction of propagation as a result of the local momentum velocity of the gases. A manuscript derived from the work upon the oscillatory combustion i the pressure combustor, has been completely reworked. A significant amount of additional experimental information was included. The revised manuscript which covers all of the experimental work that has been completed with the pressure combustor for the air-natural gas system, is appended.##

09078

Cadle, R. D. and F. E. Grahek

PHOTOCHEMISTRY OF THE SYSTEM KETENE-NO-H2. In: International Conference on Photochemistry Held at Munchen, September 6-9, 1967,Part I, Preprints. Max-Planck-Institut fuer Kohlenforschung, Muelheim an der Ruhr, West Germany, p. 113-125, Sept. 1967.
CFSTI: PB 176466

Nitric oxide has been found to react rapidly with singlet methylen produced by the photolysis of ketene and possibly also with excite ketene, judging from the ratios ethylene produced/ketene reacted. The presence of nitric oxide prevented the formation of methane an ethane when ketene-NO-H2 mixtures were irradiated at room temperature or 200 C. The products resulting from the presence of nitric oxide were all of low molecular weight, judging from the mass spectra. Eight products were separated using gas chromatography and their mass and infrared spectra determined. Only one, hydrogen cyanide, was definitely identified. (Authors' abstract)

09079

K. P. Preston, R. J. Cvetanovic

THE PHOTOOXIDATION OF BUTENE-1 BY NITROGEN DIOXIDE AT SHORT WAVE-LENGTHS. In: International Conference on Photochemistry Held at Munchen, September 6-9, 1967, Part I, Preprints. Max-Planck-Institut fuer Kohlenforschung, Muelheim an der Ruhr, West Germany, p. 166-192. Sept. 1967. 17 refs.
CFSTI: PB 176466

The photooxidation of butene-1 by nitrogen dioxide has been studied at 2288 A and at longer wavelengths. From the measured effects of additions of inert and other gases on the product yields it is concluded that 1D2 oxygen atoms participate in the photooxidation at 2288 A. Ground state oxygen atoms, produced by the photodissociation of NO2 and possibly by quenching of O(1D) by the olefin, are also important in the photooxidatiin at 2288 A, and are believed to give rise to practically all of the observed yields of the addition porducts, n-butanal and 1,2 epoxybutane. The indications are that the reaction of O(1D) with butene-1 at total pressures below one atmosphere yields very little stabilized addition product. (Authors' abstract)##

09755

Cullis, C. F., R. M. Henson, and D. L. Trimm

THE KINETICS OF THE HOMOGENEOUS GASEOUS OXIDATION OF SULPHUR DIOXIDE. Proc. Roy. Soc. (London). Ser.A, Vol. 295, p. 72-83, Nov. 8, 1966. 20 refs.

Studies of the gaseous oxidation of sulphur dioxide show that in the absence of added catalysts an apparently homogenous reaction can be observed only over a rather narrow temperature range (900 to 1050 deg. C). On the basis of the dependence of the rate of this reaction on the concentration of the reactants and of the value of the activation energy a tentative reaction mechanism is proposed which involves initially the collisional activation of sulphur dioxide. In the presence of nitric oxide, reaction takes place at an appreciable rate at temperatures as low as 400 deg. C. The catalysed reaction is essentially homogeneous and its rate is unaffected by nitrogen and water vapour. At fairly high concentrations of nitric oxide, the rate is approximately proportional to the square of the catalyst concentration and to the first power of the oxygen concentration, but is almost independent of the concentration of sulphur dioxide and of temperature. In the presence of lower concentrations of the additive, the rate is approximately proportional to the first power of both the nitric oxide and oxygen concentrations, increases slightly with the sulphur dioxide concentration, and is appreciably dependent on temperature. The observed kinetic relationships can be satisfactorily explained in terms of a mechanism involving the interaction of sulphur dioxide with the species, NO2 and NO3, the relative contribution of the two reactions vary with the concentrations of the reactants and with temperature.

10129

Hurn, R. W., Basil Dimitriades, and R. D. Fleming

EFFECT OF HYDROCARBON TYPE OF REACTIVITY OF EXHAUST GASES. In: Vehicle Emissions, Part II, SAE Progress in Technology Series, Vo., 12, New York, Society of Automotive Engineers, Inc., 1966, p. 1-9. 6 refs. (Presented at the Mid-Year Meeting, Society of Automotive Engineers, Chicago, Ill., May 1965.)

Unburned hydrocarbons and other products of combustion are recognized as contributors to photochemical air pollution. The work reported here was a first approach in finding an expression of exhaust gas quality--or compositional characteristic--that would associate directly with the photochemical activity of the composite sample. Olefins, aromatics, and partial oxidation products have been cited as the principal smog precursors in exhaust gas. However, results of this study indicate that for the general case, collective determination of these classes provides and unreliable indication of reactivity. The findings are expected to be useful in further development of methods to measure -- or predict -- the air polluting potential of exhaust gas with increased reliability. (Authors abstract)

10907T

Lunge, G. and E. Perl

NITROGEN OXIDES AND THE LEAD CHAMBER PROCESS. II. BEHAVIOR OF A MIXTURE OF GASES, PRESUMABLY $NO + NO_2$, IN CONCENTRATED SULFURIC ACID AND SODIUM HYDROXIDE 1/5 N. ((Untersuchungen ueber Stickstoffoxyde und ueber den Bleikammerprozess. II. Verhalten eines Gasgemisches von der ungefaehren Zusammensetzung $NO + NO_2$ gegen konz. Schwefelsaeure und 1/5-n. Natronlauge.)) Translated from German. Z. Angew. Chem. (Weinheim), 19(19):857-869, May 1906.

The behavior of a gas mixture containing NO and NO_2 in sulfuric acid and sodium hydroxide was investigated with the resul that for analytical purposes sulfuric acid is the only absorption liquid for this gas mixture. Also the behavior of nitrogen oxide in the presence of oxygen and water was studied together with the kinetics of nitrogen oxide oxidation with oxygen or air. The kinetic curves indicated that the reaction $2NO+O_2=N_2O_4$ takes place at a constant rate which indicates that the oxidation takes place directly without formation of N_2O_3 as an intermediate.##

11279

Jatte, Sigmund and Fritz S. Klein

ISOTOPIC EXCHANGE REACTIONS OF ATOMIC OXYGEN PRODUCED BY THE PHOTOLYSIS OF NO_2 AT 3660 A. Trans. Faraday Soc. 62(527), Part II, pp. 3135-3141, Nov. 1966. 26 refs.

Isotopically labelled atmoic oxygen, produced by the photolysis of N1302 at 3660 angstroms, was allowed to react with CO, CO_2 N_2O, O_2 and $COCl_2$, respectively. The rates and mechanisms of the exchange reactions are discussed. The specific rate constants were determined for the process.##

13212

Kjellman, B.

VENTILATORY EFFICIENCY, CAPACITY AND LUNG VOLUMES IN HEALTHY CHILDREN. Scan. J. Clin. Lab. Invest., 23(1):19-29, Feb. 1969. 48 refs.

The ventilatory efficiency of healthy children was investigated with a nitrogen wash-out technique. Nitrogen elimination time was considerably shorter than in adults and the reproducibility was lower. The reproducibility of wash-out volume, functional residual capacity (FRC) and lung clearance index (LCI) was as high for the children as that reported for adults. The mean and SD values of LCI agreed with those found in adults, investigated with the same equipment. The range of the Lichtneckert-Lundgren index of alveolar ventilation (IAV) was in agreement with that found in adults. Lung volumes and ventilatory capacity differed in some respects from the findings in earlier investigations of healthy Swedish children. (Author abstract modified)

13223

Adrussow, Leonid

THE CATALYTIC NITRIC OXIDE REDUCTION AND AMMONIA OXIDATION (IV). (Uber die katalytische Stickoxyd-Reduktion und Ammoniak-Oxydation (IV)). Text in German. Chem. Ber., vol. 60:536-540, 1927. 13 refs.

For further clarification of the ammonia oxidation which was studied in three earlier works, it seemed desirable to also study the reverse process, i.e., the reduction of nitric oxide to ammonia. For this purpose, a mixture of nitric oxide and hydrogen was passed with constant speed over a Pt screen catalyst. After a period of 50 to 80 min required to establish equilibrium, the vessels for the analysis were connected. Ammonia was absorbed by distilled water in the apparatus and a constant flow of oxygen for oxidation to NO was added. The nitric oxides thus obtained were absorbed in sodium hydroxide and frozen with liquid air. Compared to the rapid oxidation of ammonia, the effect of molecular hydrogen on nitric oxide with a platinum catalyst is rather sluggish even at contact times 1000 times as long. Even at the high temperature of 850 C, half of the nitric oxide passed the catalyst without dissociation. Prolonging the contact period from 0.001 sec to 0.006 and 0.003 sec lead to a 90% reduction of the nitric oxide. Between 600 and 650 C, a considerable amount of nitrogen formed, due to the dissociation of ammonia product. Without a catalyst, the effect of hydrogen on nitric oxide remains sluggish even at high temperatures.

13224

Manchot, W. and Hans Schmid

THE STUDY OF METAL NITROSO COMPOUNDS: A NITRIC OXIDE COMPOUND OF MANGANESE. (Zur Kenntnis der Metall-Nitroso-Verbindungen: Uber eine Stickoxyd-Verbindung des Mangans). Text in German. Chem. Ber., vol. 59:2360-2363, 1926. 3 refs.

A nitric oxide compound of manganese was prepared for the first time. $MnCl_2$ is brought in contact with potassium cyanide in aqueous or 30% alcohol solution, nitric oxide is rapidly absorbed. The amount of nitric oxide absorbed depends on the quantity of potassium cyanide used. As systematic experiments showed marked NO absorption took place beginning with a KCN concentration of 1 mole and increased with higher potassium cyanide quantities. At 5 moles KCN, a maximum of one mole NO per atom of manganese was absorbed. In one experiment, a pink precipitate formed in addition to the colored permanganate solution. As more potassium cyanide was added, no further precipitation was obtained; there was only a clear solution whose color intensity increased with higher NO binding at higher quantities of potassium cylanide. The experiments also showed that NO binding is irreversible. With aqueous solution, NO consumption is lower than with alcohol, particularly at lower KCN concentrations, and more precipitate forms. To prepare the compound, 4.90g Mn acetate, one mole H_2O, and 3.92g potassium acetate are dissolved in 10 cc water over a water bath. After cooling, 30 cc alcohol are added. Then, in a nitric oxide atmosphere, 6.5g (5 mol) potassium cyanide in 15 cc water is added at 0 C or at room temperature. A considerable but varying amount of gray-green KMn(CN)3 forms, while the solution turns purple. After several precipitating and filtering operations, about 1 to 2 g of crystallized pure substance is obtained. The results of the analyses show complete agreement with the experiments on nitric oxide binding by MnC12 and potassium cyanide mixtures. Manganese is neither oxidized nor reduced. The compound corresponds to the sodium nitroprusside of Fe(II).

13265

Pierce, J. A.

A STUDY OF THE REACTION BETWEEN NITRIC OXIDE AND HYDROGEN SULPHIDE. J. Phys. Chem., 33(1):22-36, Jan. 1929. 15 refs.

The conditions of the reaction between nitric oxide and hydrogen sulfide were studied at temperatures between 28 and 100 C. Reaction conditions varied by conducting a series of experiments in, (a) a plain glass chamber, (b) with added silica gel, and (c) with added glass wool. The reaction proceeded under all conditions; the slowest velocity was obtained when no catalyst was used. Increased surface provided by glass wool accelerated the reaction to a rate comparable to that with silica gel. The reaction is heterogeneous, as confirmed by the slowing of the reaction in the presence of inhibiting colloidal sulfur. The stoichiometric expression for the reaction is: 2NO = 2H2S yields 2H20 = 2S = N2. A negative temperature coefficient was found and ascribed to decreased association of NO to form N202 at the higher temperatures. The accumulation of colloidal sulfur as a result of the reaction is the cause of the inhibitory effect observed. It appears to be a mechanical coating of the catalyst. The glass wall of the reaction chamber and the filaments of glass wool were acted upon by water and H2S with formation of amorphous silicon dioxide. (Author summary modified)

13312

Schonfeld, E.

COMPUTER CALCULATED CONCENTRATIONS IN THE REACTIONS OF NITROGEN AND OXYGEN. J. Chem. Educ., 45(3):173-175, March 1968.

The efficiencies of the reaction of nitrogen and oxygen to form NO at high temperatures and the further oxidation of NO to NO2 at low temperatures can be calculated as a function of the initial gas composition, temperature, and pressure. Three computer programs were developed to perform all the computations. The first one computed equilibrium constants for all the reactions as a function of temperature. The input values to the program were the thermodynamic values that can be obtained from tables. The second and third computer programs solved the equilibrium concentrations of the high temperature reactions and low temperature reactions, respectively. These programs permiteed the determination of the equilibrium yields of NO and NO2 as a function of temperature, pressure, and initial conditions (for any N/O atom ratio). The computer programs were written in Fortran.

13341

Ashmore, P. G. and B. P. Levitt

THERMAL DECOMPOSITION OF NITROGEN DIOXIDE. Res. Correspondence, 9(6):S25-S26, June 1956. 3 refs.

Unusually high initial rates were observed for the thermal decomposition of nitrogen dioxide at low pressures near deg C. The decomposition reaction followed second order kinetics and therefore the graph of 1/NO2 against time should be linear. With runs at higher pressures, however, the slope reached a constant value rapidly. This non-linearity was completely suppressed by the addition of an equal pressure of nitric oxide. Nitrogen did not have the same effect, even at pressures up to 0.5 atm. A reaction scheme involving the NO3 radical was suggested to explain these results.

13354

Stopperka, K., F. Wolf, and G. Suss

INVESTIGATIONS INTO THE REACTIONS BETWEEN NITROGEN DIOXIDE AND SULFUR DIOXIDE IN THE GAS PHASE. (Untersuchungen uber die Umsetzung zwischen Stickstoffdioxid und Schwefeldioxid in der Gasphase). Text in German. Z. Anorg. Allgem. Chem., 359(1/2): 14-29, June 1968. 21 refs.

After reviewing earlier work on nitrogen dioxide/sulfur dioxide reactions, it is concluded that the catalytic action of water was never properly investigated. In the present work, the gas phase interaction between NO2 and SO2 at H2O partial pressures of 0.005 Torr and 0.000001 Torr and temperatures up to 230 C were manometrically investigated. At an H2O partial pressure of less than 0.000001 Torr, the reaction started at 225 C according to the equations: 2 NO2 yields 2 NO plus O2; 2 SO2 plus O2 yields 2 SO3; and 2 SO3 plus NO2 plus NO yields (NO)2S2O7. In the presence of water vapor at a partial pressure less than 0.005 Torr, the reaction 3 NO2 plus 2SO2 plus H2O yields 2 HOHSO4 plus NO proceeds rapidly even at 25 C. An equilibrium between N2O3 and NO2 plus NO is established. After all water is consumed, the reaction doesnot stop, but it changes to the following: 3 N2O3 plus 2 SO2 yields (NO)2S2O7 plus 4 NO, and NO plus 3 NO2 plus 2 SO2 yields (NO)2S2O7 plus 2 NO. During all reactions, the walls of the vessels were covered by hard, white crystals which were identified as (NO)2S2O7 with admixtures of NOHSO4. Since this reaction is important for gypsum-sulfuric acid plants, other catalysts were investigated. Glass wool, Pt-asbestos, rust, and V2O5 did not influence the reaction other than as water carriers. The apparatus used is described and the compound (NO)2S2O7 was identified by its melting point and Debye pattern.

13355

Brcic, Branko S., Danilo Dobcnik and Ljubo Golic

THE REACTION KINETICS OF NITROGEN OXIDES WITH CALCIUM OXIDE. (Uber den Verlauf der Bindung der Stickstoffoxyde an

Calciumoxyd). Text in German. Monatsh. Chem., 94(6):1145-1153, 1963. 6 refs.

For the isothermal measurement of the sorption of nitrogen oxides on CaO at pressures from 0.05 to 1 atm and at temperatures from 20 to 650 C, the CaO was freshly prepared from CaCO3 by heating to 900 C within 90 min and maintaining this temperature for 30 min. The specific surface obtained was 5.0 plus or - 0.2 sq m/g. The nitrogen oxides were obtained from nitric acid and P205. The measuring unit consisted roughly of a quartz spiral and a thermocouple. The results show that in the reaction process, Ca(NO3)2 is mainly formed, along with small amounts of Ca(NO2)2. A 6% maximum amount of Ca(NO2)2 is formed at 150 C and decreases with rising temperature. Above 350 C, the fraction is as low as 2%. It also decreases with time: at 300 C, 4.3% was measured after 40 min., 2.6% after 180 min., and 1.9% after 1200 min. Reaction kinetics over the temperature range studied at 1 atm can be divided into three stages. During the first stage below 50 C, N205 is formed. Its reaction with CaO results in the formation of Ca(NO3)2, which is no obstacle to further reaction. In the second stage, between 50 and 400 C, a nitrate layer develops rapidly on the surface, preventing any further formation of Ca(NO3)2 by blocking diffusion of the nitrogen oxides. In the third stage, above 400 C, the gaseous phase comes in contact with a more or less pronounced melt where the mixture of nitrogen oxides and oxygen dissolves and leads to further formation of Ca(NO3)2. At 610 C, the sorption limit is reached.

13390

Wippermann, F.

DISTRIBUTION OF CONCENTRATION FLUCTUATIONS OF A NOXIOUS GAS DIFFUSING IN THE ATMOSPHERE. (Ueber die Verteilung der Konzen trationsschwankungen eines sich in der Atmosphaere ausbreitenden Schadgases.) Text in German. Z. Meteorol., 20(1-6):1-10, 1968. 10 refs.

Continuing work is reported on the analytical description of the space distribution of gas diffusing from one or several point-like emission sources. It was found that the statistical distribution of concentration fluctuations is of the Poisson type, if the concentration values are expressed in units of a reducing concentration. The method of calculating the latter is described. A direct relationship between the parameters of the statistical distribution and those of the gas diffusion process provides the means to predict the statistical distribution when one or more emission sources are simultaneously present. Know ledge of the statistical distribution enables one to predict the ratio of peak to mean concentrations under given diffusion conditions. A comparison of theoretically computed and experimentally determined ratios was possible in only two cases due to a lack of sufficiently complete experimental data. It is shown that the emission characteristics incorporated in the official anti-air pollution regulations are determined soley by the mean of the statical distribution of concentration fluctuations, as long as it is of the Poisson type.

13392

Addison, W. E. and R. M. Barrer

SORPTION AND REACTIVITY OF NITROUS OXIDE AND NITRIC OXIDE IN CRYSTALLINE AND AMORPHOUS SILICEOUS SORBENTS. J. Chem. Soc., Part 1, p. 757-769, 1955.

Zeolite-induced reaction processes occurring in an intracrystalline environment were investigated by observing the sorption and reactivity of nitrous and nitric oxide in crystalline sorbents (chabazite, mordenite, faujasite and the synthetic zeolite Na-A) and amorphous sorbents (porous glass, Doucil, and silica gel). All sorbents were outgassed for 24 hr at indicated temperatures, and first characterized and compared by a study of oxygen and argon sorption. The affinity between oxygen and the sorbent varied according to the cation present. Nitrous oxide was sorbed much more strongly than oxygen or argon so its sorption was studied between -78 and 350 K. Both chabazite and mordenite were effective in bringing about the reaction 4NO equals N2O3, but intracrystalline nitrate and nitrite reduced the sorption activity of chabazite. Disproportionation of sorbed nitric oxide was noted in the reactivity of sorbed nitric oxide towards oxygen. Findings indicate striking differences between zeolites acting as disproportionation catalysts and the relatively feeble catalysts observed with siliceous gel sorbents. It was concluded that an intracrystalline environment promotes reactivity.

13407

Gehlen, Heinz

ON THE REACTION AND PROPERTIES OF NITRIC OXIDE AND ITS COMPOUNDS. II. STUDIES OF THE SALTS OF NITRIC OXIDE-SULFUROUS ACID. (Ueber Reaktionen und Eigenschaften des Stickoxyds und seiner Verbindungen, II. Mitteil.: Zur Kenntnis der Salze der stickoxyd-schwefligen Saeure.) Text in German. Chem. Ber., 65:1130-1140, 1932. 19 refs.

While the alkali salts of nitric oxide-sulfurous acid, e.g. K2SO4.N2O (2HONHSO3K plus 2KOH plus O yields K2SO4.N2O plus K2SO3 plus 3H2O), had been studied in detail, the corresponding heavy metal salts could not be obtained. But the reaction between heavy metal salts and K2SO4.N2O yields double salts, some of which are described here. The salt K2SO4.N2O was prepared by the reaction of nitric oxide gas with potassium sulfite. A reaction of this alkali salt with zinc sulfate produced K4Zn(SO4,N2O)3. Similarly, K4Co(SO4,N2O)3, K4Mn(SO4,N2O)3, and K2Cd(SO4,N2O)2 were obtained. The coloration of aqueous solutions of these double salts indicates complex formation. Addition of sulfuric acid destroys the color, while K2SO4.N2O restores it. The decomposition temperatures were determined. The chemical analysis of the four double salts is briefly described. The thallium salt Tl2SO4.N2O, was also prepared. The absorption rates of nitric oxide on the sulfites of thallium, lithium, sodium and potassium were also studied, and no differences in the rates were found. The homologous compounds, i.e., the selenites and tellurites, cannot absorb nitric oxide in alkaline solution. It is proposed that the easy and complete decomposition of K2SO4.N2O be used for the preparation of N2O. Nitrous oxide was determined by the explosion method after mixing with hydrogen.

13415

Haseba, S., T. Shimose, N. Kubo, and T. Kitagawa

NITRIC OXIDE EXPLOSION. Chem. Eng. Progr., 62(4):92-96, April 1966. 8 refs.

A method was found to analyze low-concentration hydrocarbons assumed to have contributed to an explosion in the second heat exchanger of a nitrogen wash unit. Acetylene, 1,3-butadiene, and allene existed in the crude gas in the order of 2 to 3 ppm, 0.2 to 0.5 ppm, and 0.2 to 0.3 ppm, respectively. Nitric oxide was detected at concentrations in the order of 0.005 to 1 ppm through oxidation with permanganate and sulfuric acid, followed by calorimetric detection with the Griess-Saltzman reagent. Findings showed that more than 90% of NO entered the unit accumulated in the second heat exchanger, most of it oxidized to nitrogen dioxide and nitrous anhydride, which is more reactive with hydrocarbons than NO. Experiments confirmed the possibility of spontaneous ignition in the second exchanger and the composition of reaction products between nitrogen and conjugated dienes. An adsorption process is now used to remove NO, in which Na_2CrO_2 or Cl_2 are adde to the wash-water circuit.

13417

·Spealman, M. L. and W. H. Rodebush

THE REACTION OF SOME OXIDES OF NITROGEN WITH ATOMIC OXYGEN AND NITROGEN. J. Am. Chem. Soc., 57(8):1474-1476, Aug. 1935. 6 refs.

Laboratory observations of the reaction NO_2 plus O equals NO plus O_2, indicated a reaction probability of .00001 per collision at 40 deg. The reactions N plus NO_2 equals 2NO, and N plus NO equals N_2 plus O are shown to be fairly rapid. It is further reported th the reaction NO plus O equals NO_2 probably takes place by triple collision, and is accompanied by an oxygen afterglow.

13452

Clough, P. N. and B. A. Thrush

FORMATION OF VIBRATIONALLY EXCITED N_2O IN THE REACTION OF N ATOMS WITH NO_2. Discussions Faraday Soc., No. 44:205-207, 1967. 7 ref

Nitrogen dioxide was added to active nitrogen from a microwave discharge to learn if vibrational excitation characterized the newly formed bonds of the polyatomic reaction products N_2O plus O plus 42.4 kcal. At 0.5 mm, Hg, emission of v1 plus v3 and v2 plus v3 was found, but at 0.05 mm Hg the intensities of bands involving v1 and v2 were found to be greatly reduced relative to those involving only v3, demonstrating the collisional redistribution of energy from v3 to v1 and v2. When total pressur were raised, there was no evidence of either 2v3 or v2 plus v3, an it was concluded that less than 10% of the molecules formed with stretching vibrational energy have any excitation of v2. The failure to detect excitation of the bending vibration v2 suggests a 'repulsive' type of surface where the energy is released during product separation.

13454

Dunnicliff, H. B., Sardar Mohammad, and Jai Kishen

THE INTERACTION BETWEEN NITRIC OXIDE AND HYDROGEN SULPHIDE IN THE PRESENCE OF WATER. J. Phys. Chem. Vol. 34:1721-1734, 1931. 18 refs.

The reactions of nitric oxide and hydrogen sulfides in the presence of water, ammonium nitrite, ammonium sulfide, or ammonium thiosulfate were studied and their products were determined and measured. Nitric oxide reacted with hydrogen sulfide solution giving ammonium nitrite, ammonium thiosulfate, sulfur, nitrous oxide, and nitrogen. An ammonium sulfide solution was decomposed by nitric oxide to give polysulfides of ammonium and small amounts of ammonium thiosulfate and nitrous oxide and nitrogen were evolved. Excess of the reducing agent gave pure nitrogen, but excess of the oxidizing agent increased the yield of nitrous oxide. Saturated hydrogen sulfide solution completely reduced nitrous oxide to nitrogen and ammonia, and slowly converted ammonium nitrite into ammonia and small amounts of nitrogen. Nitric oxide slowly converted dilute solutions of ammonium thiosulfate into ammonium sulfate and nitrogen.

13503

Glick, H. S., J. J. Klein, and W. Squire

SINGLE-PULSE SHOCK TUBE STUDIES OF THE KINETICS OF THE REACTION N2 PLUS O2 YIELDS 2NO (2NO YIELDS N2 PLUS O2) BETWEEN 2000-3000 K. J. Chem. Phys., 27(4):850-857, Oct. 1957.

The design of combustors for jet engines, the calculation of the properties of hypersonic flow fields, and the modification and improvement of chemical processes are among the problems requiring data on high chemical reaction kinetics. In the single-pulse shock tube method, developed at the Cornell Aeronautical Laboratory for processing a reactant gas sample with a single closely controlled, high temperature reactant gas, data on high temperature kinetics is obtained by analyzing 'debris' produced by the high-temperature pulse. The kinetics of nitric oxide formed in the temperature range 2000 to 3000 K were studied, using krypton, argon, and a mixture of argon-helium as diluents. The variation observed in the apparent activiation energy for k2 with different diluents indicated that the bimolecular mechanism is not dominant. When experiments were performed at constant room temperature (2580 K), it was observed that k2 varied as the inverse square root of the concentration of air. When an oxygen nitrogen mixture was used at a constant reaction temperature of 2500 K, the k2 varied inversely with the square root of the molecular oxygen concentration parallel Zeldovich's findings. The rate-determining step in the chain is: O plus N2 yields NO plus N, with deltaH2500 deg equals 75.8 kcal/mole. The reactivation energy for this step is 74 plus or minus 5 kcal/mole. The collision cross-section is 10 to the minus 16 power sq cm, which corresponds to a steric factor of about 0.05.

13528

Michailova, E. A.

THE KINETICS OF THE REACTION BETWEEN AMMONIA AND NITRIC OXIDE ON THE SURFACE OF A PLATINUM FILAMENT. Acta Physicochim. USSR, 10(5):653-676, 1939. 16 refs.

Ammonia and nitric oxide were circulated in a closed system at pressures close to 2 cm Hg at 500-530 K. At higher temperatures, self-heating of the platinum wire occurred. Water formed during the reaction was absorbed with potassium hydroxide and partially frozen out with dry ice. The data obtained on kinetics led to the following hypothesis for the reaction mechanism: both reacting gases are well adsorbed on a platinum surface free from adsorbed oxygen; the reaction proceeds between the molecules adsorbed on neighboring elementary spaces, while the reaction products (nitrogen and water) are not adsorbed. The reaction velocity is independent of the pressures of each gas but dependent on the ratio of the pressures. It reaches a maximum at a definite ratio of the pressures of both gases. With equivalent amounts of the gases present, it is constant for the first 50 min. The apparent activation energy for the reaction is 24.8 Kg cal.

13530

Ayen, R. J. and M. S. Peters

CATALYTIC REDUCTION OF NITRIC OXIDE. Ind. Eng. Chem., Process Design Develop., 1(3):204-207, July 1962. 9 refs.

The reaction between nitric oxide and hydrogen was studied at 375,400 and 425 C and 0.005 to 0.05 atm. Temperature measurement were made with thermocouples and a potentiometer. Two important reactions were noted: One mole of nitric oxide and one mole of hydrogen form one mole of water and one-half mole of nitrogen in an equilibrium reaction, and two and one-half moles of hydrogen and one mole of nitric oxide form one mole each of water and ammonia in an equilibrium reaction. Mechanisms were developed fo these reactions, and rate and adsorption constants were evaluated from the data for the corresponding rate equations. The controlling mechanism for the first reaction is the combination of one mole of each adsorbed reactant to form water and atomic nitrogen, either directly or through intermediate steps. Hydroge dissociation appears to be the controlling mechanism in the second reaction. The study's implication for smog-control progra is suggested.

13540

Applebaum, David, Paul Harteck, and Robert R. Reeves

THE CHEMILUMINESCENT NO--O-ATOM REACTION. Photochem. Photobiol., 4(6):1003-1006, 1965. 8 refs.

New experimental data gave further information on the mechanism for the chemiluminescent NO--O-Atom reaction. Results were obtained for the change of emission intensities from 10 to 300 microns pressure. Some studies were also made on the effects of Ar, CO2, He, N2O, O2, and CF4 as third bodies. The results support a simple two body recombination for the mechanism of light emission: NO plus O equals NO2 plus energy.

13541

Himmelblau, D. M., C. R. Jones, and K. B. Bischoff

DETERMINATION OF RATE CONSTANTS FOR COMPLEX KINETICS MODELS. Ind. Eng. Chem. Fundamentals, 6(4):539-543, Nov. 1967. (31) refs.

A method of determining kinetic rate coefficients for complex reactions by user-oriented iterative methods is described. The differential equations representing the reaction system may be nonlinear in the dependent variable, but must be linear in the coefficients. Direct integration of the model for a sequence of time steps permits the model coefficients to be estimated by maximizing the multivariate correlation coefficient, which is the same as minimizing the sum of the squares of the weighted deviations. Three weighting schemes are compared. It is concluded that this method of calculating rate parameters can be used for nonlinear systems and fairly complex systems with reasonable accuracy. Its main weakness is the sensitivity of the desired parameters to errors in the initial integrals. This can be compensated for in experimentation by obtaining a greater number of data points during the rapidly changing stage of the concentration-time curve.

13545

Jordan, C. W., A. L. Ward, and W. H. Fulweiler

GUM DEPOSITS IN GAS DISTRIBUTION SYSTEMS. VAPOR-PHASE GUM (CONTINUED). Ind. Eng. Chem., 26(10):1028-1038, Oct. 1934. 10 refs.

A study of the effect of the vapor-phase gum accumulating on the adjusting needles of gas pilot lights showed that the amount of gum required to extinguish an ordinary pilot light is 0.000065 g and that the gum is produced by the catalytic oxidation of nitric oxide to nitrogen peroxide followed by the reaction of the peroxide with unsaturated hydrocarbons. Freedom from the vapor-phase gum can be assured only when the quantity of nitric oxide is on the order of 0.000005% or lower by volume. Since combustion products are the principle source of nitrogen oxides, the formation of vapor-phase gum can be controlled at its source. A suggested method of reducing nitrogen oxides is to reduce the negative pressure on retorts or ovens and to purge combustion products in water-gas sets, thereby producing a blue gas containing less than 3% total nitrogen. Methods involving oil scrubbing and steam spraying had no appreciable effect on nitric oxide.

13546

Stoddart, E. M.

THE REACTION OF PHOSPHORIC ANHYDRIDE WITH NITROGEN DIOXIDE AND WITH NITRIC OXIDE. J. Chem. Soc., p. 1459-1461, 1938.

It was shown that nitrogen dioxide and phosphoric anhydride react at 250 deg to form a glassy compound, P2O5.2NO, with the liberation of oxygen. The compound P2O5.xNO2, previously identified by Smith (J. Chem. Soc., 1928:1886), does not appear to exist. It is clear that when Smith treated his material with water, nitric oxide was evolved but not noticed, in the reaction P2O5.2NO plus H2O yields 2HPO3 plus 2NO, and this gas reacted with the oxygen present to give the brown nitrogen dioxide. The compound P2O5.2NO is also formed by direct union of nitric oxide and phosphoric anhydride. The observations are important in considering the influence of intensive drying on the reaction between nitric oxide and oxygen.

13558

Barrer, Richard M. and William E. Addison

DISPROPORTIONATION OF NITRIC OXIDE USING CRYSTALLINE ZEOLITES AS CATALYSTS. (Union Carbide Corp., New York, N. Y.) U.S. Pat. 2,853,365. 7p., Sept. 23, 1958. 1 ref. (Appl. Feb. 7, 1955, 12 claims.)

A process for disproportionating nitric oxide to form nitrous oxide and higher nitrogen oxides is presented. The nitric oxide is absorbed by partially dehydrated zeolite crystals at a temperature below 0 C. At this temperature, the nitric oxide is decomposed to nitrous oxide and nitrogen peroxide. At 150 C the nitrous oxide is liberated and the nitrogen peroxide forms nitrogen dioxide and nitric oxide. Nitrogen dioxide is liberated by heating the zeolite crystals to 200 C.

13559

Caudle, P. G. and K. G. Denbigh

KINETICS OF THE ABSORPTION OF NITROGEN PEROXIDE INTO WATER AND AQUEOUS SOLUTIONS. Trans Faraday Soc., 49:39-52, 1953. 9 refs.

Experimental measurements were made on the rate of absorption of nitrogen peroxide into water and aqueous solutions of sodium hydroxide and calcium chloride. The absorption speed was determined as a function of the gas composition, the gas and liquid flow rates, and the temperature. Over a large range of conditions it is found that the absorption rate is a linear function of the concentration of N2O4 in the gas phase. This indicates that the speed of the process is determined by the chemical reaction of N2O4 with water, and not by diffusion. In order to explain the effect of gas and liquid flow rates some tentative new ideas are put forward which represent a departure from the traditional 'two film' theory. It is suggested that, at any moment, the whole of a gas-liquid interface is not equally active in absorption, and that the activity of any part is determined by the local conditions of eddying and mixing which, in turn, depend both on the gas and liquid flow rates. Attention is also drawn to the phenomenon of rippling at the interface. (Authors' abstract modified)

13561

Chambers, F. S., Jr. and T. K. Sherwood

ABSORPTION OF NITROGEN DIOXIDE BY AQUEOUS SOLUTIONS. Ind. Eng. Chem., 29:1415-1422, 1937. 24 refs.

The significance of diffusional resistances in the absorption of nitrogen dioxide by water and aqueous solutions of nitric acid or alkali was studied. Nitrogen dioxide was absorbed from a mixture in nitrogen using basic solutions varying from 2.7 to 34.1% NaOH and acid solutions varying from 5.7 to 69.8% HNO3. Similar tests were carried out in a wetted-wall tower and in a batch absorption vessel. The observed absorption rates for NO2 were compared with corresponding evaporation rates of water in the same apparatus. The rate of absorption was greatest for pure water, and much less in strong acid or basic solution. The gas film diffusional resistance was the controlling factor in absorption rate. The results are explained by the hypothesis of reaction in the gas phase, with the deposition of a nitric acid mist in the gas film. New data are presented on vaporization of water, desorption of ammonia from aqueous solution absorption of ammonia by water and acid, and absorption of sulfur dioxide by base in the wetted-wall tower. (Authors' abstract modified)

3564

ohnston, Harold S. and Harvey J. Crosby

INETICS OF THE FAST GAS PHASE REACTION BETWEEN OZONE AND NITRIC XIDE. J. Chem. Phys., 22(4):689-692, April 1954. 7 refs.

The rate of reaction between ozone and nitric oxide was measured optically at -43 and -75 deg. A diagram of the apparatus was provided. The stoichiometry of the reaction was established with reactant concentration and temperatures (-45 deg to room temperature) higher than those used for rate studies. Under those conditions, the rate would have been too fast to follow. The reaction was a very fast second-order process, and the reactants and products were simple molecules of well-known kinetic properties. The mechanism was bimolecular: NO plus O3 yields NO2 plus O2. In view of the low activation energy for this reaction, it was compared to other similar bimolecular processes which have higher energies of activation. There appeared to be no systematic difference in pre-exponential factor between the fast and the slow reactions.

13566

Shiels, D. O.

THE SORPTION OF SULPHUR DIOXIDE, CARBON DIOXIDE, AND NITROUS OXID BY ACTIVATED CARBON. J. Phys. Chem., 33:1386-1397, 1929. 9 refs.

The adsorption of carbon dioxide, nitrous oxide, and sulfur dioxi by German activated gas-mask charcoal at 25 C was determined from 0 to 40 mm pressure for the first two gases, and from 0 to 22 mm pressure for sulfur dioxide. The amounts adsorbed at any given pressure were in the order of the respective critical temperature. The adsorption process was reversible in the case of carbon dioxi but hysteresis occurred with nitrous oxide and sulfur dioxide. T adsorption of N2O and CO2 are represented by Patrick's equation a their isotherms nearly coincide.

13574

Foster, E. Gordon and Farrington Daniels

RECOVERY OF NITROGEN OXIDES BY SILICA GEL. Ind. Eng. Chem., 43(4):986-992, April 1951. 10 refs.

Work was undertaken to develop an economical process for the recovery of the 1 to 1.5% nitric oxide produced by a thermal process for the fixation of atmospheric nitrogen which was developed at the University of Wisconsin. Basic data are presented for the dehydration and adsorption steps of a recovery process involving cooling of the product gas from the fixation furnace in a spray tower, dehydration of the gas in silica gel dryers, catalytic oxidation of the NO to NO2, and NO2 concentration by adsorption on and desorption from silica gel. A method for correlation of the rate of NO adsorption on silica gel was of great interest. The effects of silica gel depth, temperature, particle size, and gas velocity on rates of adsorption are described. Diffusion of the adsorbed NO into the solid adsorbent may be the rate-controlling step.

13576

Holmes, J. M. and R. A. Beebe

ADSORPTION STUDIES ON A SERIES OF HEAT TREATED SHAWINIGAN ACETYLENE CARBON BLACKS. Can. J. Chem., 35(12):1542-1554, 1957. 30 refs.

An experimental study has been made of the adsorption of nitrogen, sulfur dioxide, carbon dioxide, and ammonia on Shawinigan acetylene carbon black and several derivatives of this material produced by heat treatment up to temperatures of 3000 deg. The effect of the heat treatment of the Shawinigan carbon black on its adsorption of the polar and non-polar gases studied is compared with the behavior of other heat treated carbon blacks. The effect of the low oxygen content of the Shawinigan black is considered. The isosteric heats of adsorption for ammonia on the most highly graphitized material (Shawinigan 3000) have been calculated. The results are in general agreement with previous calorimetric work. A special type of hysteresis for the system ammonia - Shawinigan black has been observed. This may be due to a reversible swelling of the graphitic material.

13633

Gehlen, Heinz

ON REACTIONS AND PROPERTIES OF NITRIC OXIDE AND ITS COMPOUNDS. I. ON THE REACTION BETWEEN NITRIC OXIDE AND SODIUM HYDROSULFITE. (Ueber Reaktionen and Eigenschaften des Stickoxyds und seiner Verbindungen, I. Mitteil.: Uber die Einwirkung des Stickoxyds auf Natriumhydrosulfit.) Text in German. Chem. Ber., 64:1267-1276, 1931. 20 refs.

The method of Jellinek for preparing pure sodium hydrosulfite has been improved. By this simple laboratory process, 98.5% pure $Na_2S_2O_4$, free of chloride, can be obtained. Commercially available $Na_2S_2O_4$ can be purified without elaborate filtering. The process is described in detail, including all wet chemical checks for purity. One mole of $Na_2S_2O_4$ in aqueous solution absorbs 4.31 moles of NO. The chemical reactions taking place are: $Na_2S_2O_4$ plus 6NO plus 2NaOH yields $Na_2SO_3 \cdot N_2O_2$ plus Na_2SO_4 plus $2N_2O$ plus H_2O; and to a lesser degree, $Na_2S_2O_4$ plus 6NO plus 2NaOH yields $2Na_2SO_3 \cdot N_2O_2$ plus N_2O plus H_2O.

13640

Reysig, V. A., S. A. Stadnik, and G. M. Shchegolev

HIGH-TEMPERATURE FIXATION OF NITROGEN OXIDES. (K voprosu o vysokotemperaturnoy fiksatsii okislov azota). Text in Russian. Khim. Vysokikh Energiy, 1(6):587-591, 1967. 12 refs.

Results of numerical solution to a system of kinetic equations describing the change in state of dissociated air as a function of change in temperature and cooling rate are presented. These results are in good agreement with experiments. A method is given for obtaining from calculated data a law of cooling for NO-containing dissociated gases (especially air) which assures maximum hardening (irreversible freezing of reacting gas composition) of nitrogen oxides. The effectiveness of using the slot heat exchanger in plasmochemical processes is demonstrated.

13742

Nesterenko, V. B. and B. Ye. Tverkovkin

REACTION KINETICS FOR THE REVERSIBLE SYSTEM N_2O_4 IN EQUILIBRIUM WITH $2NO_2$ IN EQUILIBRIUM WITH 2NO PLUS O_2 IN A FLOW. (Issledovaniye kinetiki khimicheskikh reaktsiy sistemy N_2O_4

v ravnovesii s 2NO2 v ravnovesii s 2NO plus O2 v potoke). Text in Russian. Vestsi Akad. Navuk Belarusk. SSR, Ser. Fiz. Tekhn. Navuk, no. 2:12-19, 1966. 6 refs.

The reversible reactions N2O4 yields 2NO2 yields 2NO plus O2 are assumed to take place in a moving gas with varying moisture concentration and average flow temperature and to significantly affect flow hydrodynamics. The stationary system of differential equations describing the reaction kinetics of this system is then analyzed to yield more reliable information regarding the space-time changes in concentrations of the mixture components and average flow temperature than is given by classical approaches. The following variables are plotted as functions of channel length: average gas temperature (Tg), degree of dissociation (alpha), partial pressure of mixture components, Tg and alpha for various residence times of the mixture in the channel, Tg and alpha for various pressures in the channel, Tg and alpha for various residence times in the case of cooling, partial pressures of components for various residence times in the case of cooling, Tg and alpha for different starting temperatures (from about 430-770 K). The importance of experimental reaction rate constants, determined under actual dynamic conditions, for the study of reaction kinetics in flows is stressed.

13748

Stevenson, F. J. and R. J. Swaby

NITROSATION OF SOIL ORGANIC MATTER: I. NATURE OF GASES EVOLVED DURING NITROUS ACID TREATMENT OF LIGNINS AND HUMIC SUBSTANCES. Soil Sci. Soc. Am. Proc., p. 773-778, 1964. 15 refs.

Manometric and infrared studies of the gaseous products formed by reacting HNO2 with humic and fulvic acids, lignins, lignin-building units, and polyphenols showed the presence of N2, N2O, and CO2. In addition, methyl nitrite (CH3ONO) occurred in the gases, obtained from lignins and certain phenolic derivatives. The CH3ONO originated through dismutation of phenolic ethers, the CO2 from decarboxylation of aromatic acids and cleavage of ring structures. Aromatic-like substances interfere with the determination of free amino groups in soil organic matter by the Van Slyke nitrous acid method. (Author abstract)

13680

Atroshchenko, V. I., V. M. Kaut

KINETICS OF NITROGEN OXIDE ABSORPTION BY CONCENTRATED NITRIC ACID. (Kinetika pogloshcheniya okislov azota kontsentrirovannoy azotnoy kislotoy). Text in Russian. Zh. Prikl. Khim., vol.31: 352-360, 1958. 11 refs.

New experimental data regarding the kinetics of absorption of nitrogen oxides by concentrated nitric acid are presented. Dependencies between the absorption rate coefficient and basic physicochemical factors such as NO2 and N2O concentration in the gas phase, content of nitrogen oxides in the gas, HNO3 concentration in the acid, N2O4 content of the solution, and temperature are established. A dependence between absorption rate coefficients and basic hydrodynamic factors is demonstrated.

13683

Nobe, Ken and L. L. Wikstrom

CATALYTIC DECOMPOSITION OF NITROGEN DIOXIDE. Preprint, Am. Chem. Soc., Pittsburgh, Pa., Div. Water, Air Waste Chem., 268-273, 1963. 11 refs. (Presented before the Div. of Water and Waste Chem., Am. Chem. Soc., Los Angeles, March 31 - April 5, 1963).

Studies on the catalytic decomposition of NO2 in N2 and in air were carried out with CuO- and CeO2-alumina catalysts at 304 to 520 C at gas space velocities ranging from 1400 to 11,200/hr. With CuO-alumina catalysts and initial NO2 concentrations of 1260 ppm, 99% of the NO2 was dissociated to NO, N2, and O2. At higher flow rates, the conversion varied linearly with the gram weight of the catalyst per flow rate of the reactant in moles per sec, indicating that the rate of dissociation of both NO2 and total nitrogen oxides is zero order. At lower flow rates, the conversion approached a constant value. Specific rate constant values were determined for different temperatures, activation energy, and frequency factor of zero order reactions. At a given temperature, flow rate, and initial concentration, the conversion of NO2 to N2 and O2 in air was less than in N2. No distinct reaction order fits the data obtained for this reaction. CeO2 was more active than CuO between 480 and 520 C, but less active below 480 C. It is assumed that the catalysts selectively adsorbed NO2 on active sites which were on the order of 10 to the 11th power/sq cm.

13685

Ganz, S. N. and L. I. Mamon

KINETICS OF FILM ABSORPTION OF NITROGEN(II) OXIDE BY FESO4 SOLUTIONS. (Kinetika plenochnoy absorbtsii okisi azota rastvorami FeSO4). Text in Russian. Zh. Prikl. Khim., vol. 30: 369-379, 1957. 5 refs.

The kinetics of film absorption of NO by FeSO4 solutions was studied experimentally in order to establish the nature of the driving forces of the process as a function of change in sorbent concentration and partial pressure of the absorbing component. It was found that at relatively low concentrations of NO in the gas and a gas flow speed of 0.1-1 m/sec, the NO absorption coefficient increases as the 0.8 power of the gas speed. The total absorption coefficient may be taken equal to the partial coefficient (Kg) along the gas film, since the resistance of the latter is the process-limiting factor. An empirical kinetic equation expressing Kg as a function of the gas Reynolds number is given in dimensionless form and is suitable for designing industrial absorption equipment.

13688

Ganz, S. N. and M. A. Lokshin

EFFECT OF BASIC PHYSICOCHEMICAL FACTORS ON RATE OF ABSORPTION OF NITROGEN OXIDES BY A SOLUTION OF CALCIUM HYDROXIDE IN MECHANICAL ABSORBERS WITH A LARGE NUMBER OF ROTATIONS. PART II. (Vliyaniye osnovnykh fizikokhimicheskikh faktorov na skorost' absorbtsii okislov azota rastvorom $Ca(OH)_2$ v mekhanicheskikh absorberakh s bol'shim chislom oborotov. Soobshcheniya II). Text in Russian. Zh. Prikl. Khim., 30(10):1525-1535, Oct. 1957. 6 refs.

New data on the effect of basic physicochemical factors on the rates of NO, NO_2, and N_2O_3 absorption by $Ca(OH)_2$ solution are presented. It is established that: absorption rate decreases at temperatures above 45-50 C; an increase in concentration of nitrogen oxides under the hydrodynamic conditions studied leads to acceleration of the absorption process; in the absence of nitrite-nitrate salts, a change in CaO concentration has practically no effect on process rate; in all cases an increase in concentration of nitrite-nitrate salts reduces the absorption rate, an increase in CaO concentration retarding the decrease in absorption rate in this case. It is established that absorption of N_2O_3 and NO_2 proceeds at practically the same rate under turbulent conditions. Preferential accumulation of nitrate salts in the solution indicates rapid oxidation of NO to NO_2 taking place in the liquid phase and the occurrence of an inversion process under the experimental conditions used.

13822

Serdyuk, L. S. and A. G. Tabachnikov

THERMODYNAMIC PROPERTIES OF NITRIC OXIDE AT 200-2000 K AND 1000 BAR. (Termodinamicheskiye svoystva okisi azota v intervale temperatur 200-2000 K i do davleniy 1000 bar). Text in Russian. Inzh. Fiz. Zh., 13(1):114-117, July 1967. 4 refs.

A previously derived equation of state was used to calculate molar density, enthalpy, and entropy for nitric oxide at each 100-deg interval from 200 to 1000 K and each 200-deg interval from 1200 to 2000 K for 18 different pressures ranging from 1-1000 bar. Three pages of data are tabulated.

13823

Pozin, M. Ye., V. V. Zubov, L. Ya. Tereshchenko, E. Ya. Tarat, and Yu. L. Ponomarev

SOLUBILITY OF NITRIC OXIDE IN WATER SOLUTIONS OF CERTAIN SALTS. (Rastvorimost' okisi azota v vodnykh rastvorakh nekotorykh soley). Text in Russian. Izv. Vysshikh Uchebn. Zavedenii, Khim. i Khim. Tekhnol., 6(4):608-616, 1963. 16 refs.

Statistical methods were applied to new experimental data on the solubility of NO in water solutions of $CuSO_4$, $CuCl_2$, $MnSO_4$, H_3PO_4, $CoSO_4$, $NiSO_4$, $Cu_2(NH_3)_nCl_2$, Na_2SO_3, $FeSO_4$, and $FeCl_2$.

Maximum NO solubility under absorption conditions was exhibited by Na2SO3, FeSO4, and FeCl2 solutions and ammonia solutions of monovalent copper, the process of NO absorption being reversible in all cases except with sodium sulfate. Solutions of divalent iron salts and of sodium sulfate are seen as industrially important NO absorbers. Equilibrium of the NO - iron salt solution systems at salt concentrations up to 20-30% was studied for the temperature range of 10-90 C. An approximation formula for determining the equilibrium constant for salt concentrations greater than 0.7 g-mole/liter is presented. Nomograms for determining the NO equilibrium pressure in FeCl2 and FeSO4 solutions are plotted.

13824

Tseytlin, A. N. and K. Ye. Romanenko

ABSORPTION OF NITROGEN OXIDES BY SULFURIC ACID. (K voprosy ob absorbtsii okislov azota servoy kislotoy). Text in Russian. Izv. Vysshikh Uchebn. Zavedenii, Khim. i Khim. Tekhnol., 9(1):85-88, 1966. 12 refs.

The dependence of absorption rate on composition of the liquid phase (sulfuric acid monohydrate and NO3 content), temperature, linear gas flow rate, and reflux density was studied. It is shown that as linear gas rate increases, the absorption coefficient increases to some limit, depending upon the composition of the liquid phase, and reaches a maximum near 0.8-1.0 m/sec. Reflux density has negligible effect on the absorption coefficient of nitrogen oxides (with complete surface wetting). Absorption coefficient increases with sulfuric acid concentration only up to 87-88%. Increasing the NO3 content and temperature leads to a reduction in absorption coefficient which limits the nitrosylsulfuric acid content of the final solution. Data presented may be used in designing absorbers. Production of high nitrosylsulfuric acid concentrations requires using sulfuric acid concentrations of at least 80-82%. Sulfuric acid of this concentration can be obtained by the tower process as well as by the contact process.

13876

Remy, H. and W. Hene

ADSORPTION OF GASES BY ACTIVE CHARCOAL. (Ueber die Adsorption von Gasen durch aktive Kohle). Text in German. Kolloid - Z. (Germany), 61(3):313-322, Dec. 1932. 12 refs.

The adsorbability of a number of gases by a highly active charcoal was studied. A simple relationship was found to exist between the adsorbabilities at 15 C and the vapor pressures of the liquefied gases at 15 C. The dependence on pressure of adsorption at room temperature (15 C) of the gases H2, O2, N2, N2O, CO2, SO2, and CH3Cl was investigated as was the dependence on temperature of the adsorption at atmospheric pressure of the gases H2, CO2, SO2, NH3, and CH4. An empirical formula was derived which jointly represents the adsorbabilities of the latter gases at those temperatures at which their vapor pressures are equal. A few exploratory experiments were carried out on the adsorption of gas mixtures by charcoal. It was discovered that with any of the several gas mixtures used, the total amount adsorbed was not related simply to the sum of adsorbabilities of its individual components. However, this amount corresponded approximately to the mean value of the adsorbabilities of the individual components of the mixture.

13889

Jaffe, Sigmund and Fritz S. Klein

PHOTOLYSIS OF NO2 IN THE PRESENCE OF SO2 AT 3660 A. Trans. Faraday Soc., 62(521):2150-2157, May 1966. 16 refs.

Nitrogen dioxide was irradiated at 3660 A in the presence of SO2. Quantum yields were measured as a function of SO2 pressure, and the specific rate constant for O plus SO2 yields SO3 was determined. The ratio of rate constants for the proposed reactions: SO3 yields O plus SO2 and SO3 M yields SO3 plus M, was estimated to be 0.077 mole/l by the combination of the results of quantum yields with those of isotopic oxygen scrambling. A simple, bimolecular dark reaction was also observed.

13894

Mirzoyeva, L. M.

THERMODYNAMIC EQUILIBRIUM COMPOSITION AND THERMODYNAMIC PARAMETERS OF NITROGEN-OXYGEN HIGH-TEMPERATURE REACTION PRODUCTS. (Termodinamicheskiy ravnovesnyy sostav i termodinamicheskiye parametry produktov reaktsil azotno-kislorodnykh smesey pri vysokikh temperaturakh). Text in Russian. Izv. Akad. Nauk Azer. SSR, Ser. Fiz. Tekh. i Mat. Nauk, no 6:70-75, 1967. 8 refs.

Using data from the literature, calculations of composition and thermodynamic parameters were made for nitrogen/oxygen ratios (Q) of 1:1 and 1:3 at 2000-6000 K and 1-10 atm. Reaction is assumed to take place in a plasma column containing a mixture of N2, O2, NO, N, and O. Maximum NO yield was found to occur at about 3500 K for all values of Q. The following dependences are plotted: NO molar fraction vs temperature at 1 atm for both values of Q; NO molar fraction vs temperature with Q of 1 at 1.2 and 10 atm; enthalpy of gas vs temperature for Q of 1 and 1/3 at 1.2 and 10 atm; molecular weight of air and gas vs temperature for Q of 1 and 1/3 at 1.2 and 10 atm.

13895

Rozlovskiy, A. I.

KINETICS AND MECHANISM OF NITRIC OXIDE DISSOCIATION. (Kinetika i mekhanizm razlozheniya okisi azota). Text in Russian. Zh.

Fiz. Khim., 30(6):1349-1355, 1956. 15 refs.

Dissociation of nitric oxide is catalyzed in the presence of oxygen in amounts commensurate with NO content. An equation describing the reaction kinetics for any oxygen content is presented, observed regularities being subject to the formation of reaction chains. Initial reaction centers arise through equilibrium dissociation of oxygen at the reaction walls. Over a wide range of experimental conditions, the reaction proceeds with simultaneous chain and bimolecular mechanisms. Observations indicate a constant rate for the bimolecular reaction. These findings contradict those of other Soviet authors requiring a retardation of NO dissociation by oxygen. This contradiction is seen as stemming from an erroneous assumption regarding the ratio of reaction constants for N plus O2 and N plus NO, there being no possible assumption regarding the rate-determining stage which will lead to the need for retardation of the chain reaction by oxygen. A quantitative explanation of explosion experiments with excess oxygen and a qualitative explanation with excess fuel are thus made possible.

13897

Rodionov, A. I., Yu. S. Mishchenko, A. P. Klimov, and E. A. Bogdanov

ABSORPTION OF NITROGEN OXIDES BY LIMESTONE SUSPENSION. (Absorbtsiya okislov azota suspenziyey izvestnyaka). Text in Russian. Tr. Mosk. Khim. Tekhnol. Inst., vol. 40:74-77, 1963. 6 refs.

Absorption of nitrogen oxides by a limestone suspension containing 10-110 g/liter CaCO3 was studied in a sieve-plate bubbling column. The following was observed: an increase in degree of oxidation of the gas from 0.32 to 0.92 increases the degree of absorption from 42-45 to 62-65%; the degree of absorption increases with increased concentration of nitrogen oxides; the degree of absorption is independent of CaCO3 content, but the height of the foamy layer decreases, reducing the resistance of the plate; the degree of NO plus NO2 absorption remains the same when the temperature of the foamy layer is increased from 16 to 58 C.

13900

Harding, John Windsor

KINETICS OF CATALYTIC DECOMPOSITION OF NITRIC OXIDE. Illinois Univ., Urbana, Ph.D. Thesis, Ann Arbor, Mich., Univ. Microfilms, Inc., 1969, 76p. 25 refs.

This thesis presents the results, correlation, and interpretation of an experimental study of the rate of decomposition of nitric oxide on an aluminum oxide catalyst. The constants of the correlations are interpreted in terms of Langmuir-Hinshelwood mechanisms. Experiments were conducted in a different fixed-bed reactor. The reactor was operated at 644 to 807 C with space velocities of 168 to 2280/hr at standard temperature and pressure. Input to the reactor was 10 to 15 mole % nitric oxide diluted with nitrogen or helium. The 0.2 to 2.0% resulting conversion was measured with a photoelectric colorimeter. The rate of decomposition of nitric oxide was correlated as a function of nitric oxide concentration for all results. The mechanism supported by calculations is the reaction of two adjacently adsorbed nitric oxide molecules as the slow step with nitric oxide and nitrogen in equilibrium between gas and adsorbed phases. In this interpretation, nitric oxide is much more strongly adsorbed than nitrogen. After prolonged heating at approximately 740 C, the activated catalyst loses activity, following which the interrelations of the activation energies apparently change, although the form of the rate equation is unaltered. (Author summary modified)

13901

Kuz'minykh, I. N., A. T. Rodionov, and Yu. S. Mishchenko

ABSORPTION OF NITROGEN OXIDES FROM WASTE GASES IN A PILOT PLANT COLUMN. (Absorbtsiya okislov azota iz khvostovykh nitroznykh gazov v poluzavodskoy barbotazhnoy kolonne). Text in Russian. Tr. Mosk. Khim. Tekhnol. Inst., vol. 33:43-47, 1961. 7 refs.

Data are reported from pilot operation of a sieve-plate bubbling column designed to remove NO and NO2 from waste gases down to the current sanitary norm of 0.1 vol % and using a 10% soda solution as the absorber. Total nitrogen oxide content in the incoming gas was about 0.3%, the flow rate was 1.3 m/sec, and the reflux density was 4.3 cu m/sq m-hr. Foam height was about 35-40 mm with the temperature maintained at 20-25 C. Maximum absorption (about 65-75%) took place at an acidity of 0.5. The degree of absorption did not change appreciably when gas flow rate was increased to 2 m/sec, but the absorption coefficient increased from about 200 to about 300 kg/sq m - hr - kg/cu m. Both degree of absorption and absorption coefficient were independent of reflux rate under the above conditions.

13916

Mirev, D., C. Balarew, L. Bojadziev, and D. Lambiev

III. ABSORPTION OF NITROGEN OXIDES IN THE VIBRATING LAYER OF SODIUM CARBONATE SOLUTIONS. (III. Absorption von Stickstoffoxyden in der vibrierenden Schicht von Natriumkarbonatloesungen). Text in German. Compt. Rend. Acad. Bulgare Sci., 14(4):345-348, 1961. 3 refs.

The absorption of nitrogen oxides in the vibrating layer of sodium carbonate solutions was studied under various conditions. Experiments were made with mixtures of gases containing 0.55 to 1.8% of nitrogen oxides, with a degree of oxidation of 20 to 60%. The effects of the degree of oxidation of NO to NO2, of the oxygen content of the gas mixture, of the rate of flow of the gas stream, of the concentration of the absorbent, and of temperature on the efficiency of separation, expressed as the ratio of the absorbed nitrogen oxides over their initial concentration, were studied. The optimal conditions for implementation of the process were established. The experimental findings are in agreement with the present views of the mechanism of oxidation of NO, according to which it proceeds vigorously on the gas-liquid inter phase. It is shown that with the absorption in the vibrative layer the content of nitrogen oxides in the exhaust gas is considerably lower than with the ordinary process of absorption by barbotage.

13922

Rosenberg, R. B. and D. S. Hacker

FORMATION OF NITROGEN OXIDES IN AERATED METHANE FLAMES. Preprint, Am. Chem. Soc., Washington, D. C., Div. Fuel Chem., 10(3):91-103, 1966. 5 refs.

An investigation to determine the kinetics of the formation of nitrogen oxides produced in aerated methane flames is discussed. When a bunsen flame was used, NO formed in a narrow region near the outside edge of the flame and then diffused toward the center of the burner and into the secondary air stream where it was oxidized, forming NO_2. Very little NO_2 was found in the burning gas. Because the shape and position of the reaction zone from a bunsen flame made kinetic analysis difficult, the experimental work was changed to a flat flame. Nitrogen dioxide formed very close to the flame and then rapidly decomposed. Its concentrations decreased to zero with fuel-rich and stoichiometric primary mixtures. However, some NO_2 was found at all heights above the burner with fuel-lean primary mixtures. Three observations were drawn from this stoichiometric flame: (1) NO_2 is the nitrogen oxide formed in the flame; (2) NO_2 decomposes to NO; and (3) NO is also formed by another mechanism in the combustion products above the flame.

13930

Mueller, Ernst and Heinrich Barck

ON THE DECOMPOSITION OF NITRIC OXIDE BY HEATING WITH METALS. (Uber die Zersetzung von Stickoxyd beim Erhitzen mit Metallen). Text in German. Z. Anorg. Allgem. Chem. vol. 129: 309-320, July 19, 1923. 3 refs.

The question of whether small pieces of heated wire of various metals would be useful in reducing nitric oxide was investigated. It was hoped that this process could then be used in the microanalysis of organic compounds. Copper with zinc impurities reduced up to 88% NO at 400 C. Pure Cu reduced only 45% NO. Details of the experiments and method of analysis are given. Reasons for the incomplete reduction and inconsistency in the results are probably due to nitride formation and the production of N_2O. Silver does not reduce NO below 700 C. Iron reduces NO better than Cu. Brass reduced nothing below 600 C and 29% at 700 C. Tin is ineffective below 400 C, and above that, nitride is formed. Zinc does not reduce below 350 C, but reduces NO slowly and completely at 600 C. Bismuth produces Be_2O_3 at 400 C, reducing 73.6% NO. Lead reduces 86.6% at 600 C. Magnesium, Ca, and Al became slowly effective at 600 C. Mn reduces 68% NO at 400 C. Other metals tested were Cr, ferrochromium, lead superoxide, lead oxide, and vanadium trioxide. All quantitative conditions and experimental results are given.

13948

Foerster, F., T. Burchardt, and E. Fricke

PRODUCTION OF CONCENTRATED NITRIC ACID FROM NITROUS GASES. PARTS A AND B. (Ueber die Gewinnung konzentrierter Salpetersaeure aus nitrosen Gasen). Text in German. Z. Angew. Chem. (Weinheim), vol. 1:113-117, May 11, 1920. PARTS C, D, AND E. Ibid., p. 129-132, May 25, 1920. 10 refs.

A detailed description and discussion is presented of two series of experiments on the formation of nitric acid from nitrous gases. In the first series, a mixture of gaseous nitrogen dioxide and oxygen was passed through a bell-type wash tower filled with a nitric acid solution. In the second series, oxygen was passed through a mixture of nitric acid and liquid nitrogen dioxide or else known amounts of oxygen and that mixture were thoroughly shaken together. Conclusions are as follows: 1. The notion derived from previous experiments that the process of nitric acid formation from gaseous NO2, O2, and water cannot proceed beyond the nitric acid solution with the lowest vapor pressure, is erroneous. 2. The rate of this process in the range of concentrations of nitric acid at the lowest vapor pressure is so low that an enrichment of nitric acid beyond this range requires a rather long reaction time. 3. For such an enrichment, the smallest possible excess of oxygen and a low rate of flow of the mixture are preferable. 4. With sufficiently long test durations and with progressively decreasing utilization of the NO2, even under the most favorable test conditions, nitric acid concentration rarely goes above 80%. 5. The reason for this is that when a steaming gas mixture is used, the conditions favoring a good utilization of NO2, namely, a small oxygen excess and low rate of flow, are highly unfavorable for the thorough mixing of the reaction solution with oxygen which is also required. 6. However, one can easily attain even the highest nitric acid concentrations if one mixes less concentrated solutions of it with an appropriate amount of liquid NO2 and shakes this mixture thoroughly with oxygen. 7. The process proceeds especially rapidly when the excess of liquid NO2 is so great that, due to its limited solubility in nitric acid, the liquid mixture is heterogeneous and remains so during the reaction. 8. When nitrous gases act on water, from the equilibrium 2NO2 yields N2O4, the latter is dissolved in water and yields the primary reaction N2O4 plus H2O yields HNO3 plus HNO2. 9. The dissociation of the nitrous acid into nitric acid, nitric oxide, and water (3HNO2 yields HNO3 plus 2NO plus H2O), and the rapid oxidation of the latter, effects the transformation of the nitrous gases into nitric acid up to its highest concentrations.

13968

Bodenstein, M.

RATE OF THE REACTION BETWEEN NITRIC OXIDE AND OXYGEN. (Die Geschwindigkeit der Reaktion zwischen Stickoxyd und Sauerstoff). Text in German. Z. Elekrochem., 24(13-14):183-201, July 1, 1918. 26 refs.

A very detailed description is presented of an extensive series of experiments on the reaction of NO with O_2 that were carried out to resolve a controversy between Lunge and Berl and Raschig. Both gases were mixed at very low pressures and the reaction was followed by observing the pressure drop, with a correction being made for the formation of N_2O_4. It took place strictly in accordance with the third-order equation and its rate was found to decrease quite noticeably with increasing temperature in the interval between 0 and 90 C. Furthermore, this reaction was found to be independent of additons of NO_2, water vapor, and SO_2. The oxidation of SO_2 at the temperature used (60 C) was not catalyzed by the nitrogen oxides. The results of experiments of Lunge and Berl, evaluated in an analopous manner, were in excellent agreement with those of the author, while those of Raschig were but moderately so at conversions of more than 50%. In the light of the present knowledge of the solution process of the higher nitrogen oxides, Raschig's hypothesis regarding the role of N_2O_3 in the process of oxidation of NO to NO_2 is no longer tenable.

14055

Kurin, N. P. and I. O. Blokh

CATALYTIC OXIDATION OF NITRIC OXIDE. PART I. (Kataliticheskoye okisleniye okisi azota. Soobshcheniye I). Text in Russian. Zh. Prikl. Khim., 11(5):734-749, 1938. 10 refs.

Experimental study of three materials is reported: silica gel, vanadium catalyst used in the contact method of nitric acid production, and chromium-zinc catalyst used in methanol synthesis. These catalysts were used to oxidize NO to NO_2 with a volumetric flow rate of 200-600 per hour at 25-200 C. The incoming gas was dried over concentrated sulfuric acid and had the following composition (vol %): NO, 3.0; O_2, 7.8; atmospheric nitrogen, balance. Catalytic action occurred in all cases, total degree of oxidation decreasing with increased flow rate. As the temperature increases above 200 C, reaction rate decreased (greatest decrease with silica gel). Silica gel was found to be the best catalyst for temperatures up to 100 C. In the 150-200 C range, silica gel and vanadium catalyst were comparable, both being more active than the chromium-zinc catalyst. Rate equations are given. The apparent energies of activation for these catalysts are 4700, 1860 and 340 cal/mole.

14056

Nesterenko, V. B. and B. Ye. Tverkovkin

REACTION EQUATIONS FOR THE REVERSIBLE SYSTEM N_2O_4 YIELDS $2NO_2$ YIELDS 2NO PLUS O_2 IN A FLOW. (Uravneniya kinetiki khimicheskikh reaktsiy sistemy N2O4 yields 2NO2 yields 2NO plus O2 v potoke). Text in Russian. Vestsi Akad. Nauk Belarusk. SSR: Ser. Fiz. Tekhn. Navuk, no. 1:34-43, 1966. 13 refs.

A mathematical description of the reaction kinetics for the reversible system involving nitrogen tetroxide, nitrogen dioxide, nitric oxide, and oxygen in a flow is presented. A mathematical model of heat and mass transport in the presence of chemical reaction is described in general using the differential equations of mass, momentum, and energy conservation. Good agreement with experimental data from the literature is found. The proposed method may be applied to the question of heat flow in cases both with heating and with cooling, and also to more complex chemical reaction schemes. The question of heat exchange within the chemically reacting mixture is not treated.

14146

McCaa, David J. and Dietmar E. Rothe

EMISSION SPECTRA OF ATMOSPHERIC GASES EXCITED BY AN ELECTRON BEAM. AIAA (Am. Inst. Aeron. Astronaut.) J., 7(8):1648-1651, Aug. 1969. 6 refs.

The molecular gases NO, O2, H2O, CO, and CO2 were excited by electron beam techniques to study their interaction with the N2(plus)(1-) spectrum from 2800 to 6600 A and at 10 to 100 micron pressures. The intensity of the nitrogen fluorescence spectrum exceeds that of any other system observed. Spectra of N2, O2, CO, and CO2 are composed of molecular ion bands with some atomic lines present, while the spectra of NO, H2, and H2O consist primarily of atomic lines. Atomic lines follow a linear intensity dependence with pressure. The molecular ion bands, with the exception of N2(plus) exhibit quenching at higher pressures, the pressure at which quenching becomes significant varying among gases. Relatively strong self-quenching was observed for the first negative system of O2(plus), for the comet tail system of CO(plus), and for the Fox, Duffendack, and Barker system of CO2(plus). Characteristic self-quenching pressures for these systems appear to be 50, 20, and 150 microns Hg, respectively. Strong relative enhancement of neutral CO bands by secondary electrons was found at higher pressures. At gas pressures below 100 microns, the intensity of the N2(plus)(1-) system is not severely affected by the presence of O2, H2, H2O, or CO. (Author conclusions modified)

14179

Iyengar, R. D. and V. V. Subba Rao

ELECTRON SPIN RESONANCE OF NITROGEN DIOXIDE (NO2) ADSORBED ON ZINC OXIDE. J. Am. Chem. Soc., 90(12):3267-3269, June 5, 1968. 10 refs.

The electron spin resonance (esr) spectra of NO2 adsorbed on zinc oxide was investigated. Tests was made on high-purity zinc oxide samples with surface areas of 3 square meters per gram. Before the treatment with ultrahigh-purity NO_2, samples were outgassed for 2 hours at 500 C 0.000001 torr. The resulting esr spectra were reprinted and discussed. The outgassing procedure and thermodynamics were varied, and subsequent signal changes were analyzed. Chlorine treatment of the sample was seen to produce a sharp signal at g equal 2.015, indicating that the same peak previously noted was not due to chemisorbed oxygen atoms, the previous notion. Investigations to this point suggest the presence of shallow levels on ZnO which give rise to the signal after the loss of an electron to the interacting gas at the surface.

14214

Oza, Trambaklal Mohanlal and Vasantrai Trambaklal Oza

THE ACTION OF DINITROGEN TETROXIDE ON HYPONITRITES, NITRITES AND OXIDES. THE INDUCED DECOMPOSITION OF HYPONITRITES. J. Am. Chem. Soc., 78(15):3564-3567, Aug. 1956. 15 refs.

To elucidate the effect of nitrogen dioxide on oxides, nitrates, and hyponitrites, all of which are present in the thermal decomposition of hyponitrites, N_2O_4 and NO_2 were reacted with $Ag_2N_2O_2$, $SrN_2O_2-5H_2O$, and SrN_2O_2; with $AgNO_2$, $Ca(NO_2)_2-H_2O$, and $Ca(NO_2)_2-1/4H_2O$; and with Ag_2O and CaO. Both solid and gaseous products of the reactions were quantitatively analyzed. Results show that (1) the nitrogen of the hyponitrite molecule does not remain intact; (2) water exercises a profound influence on the reactivity of the nitrites, hydrated nitrite reacting even at 0 deg and anhydrous silver nitrite reacting only at 120 deg; (3) nitrate is the primary product of the reaction of N_2O_4 or NO_2 with CaO, but both nitrate and nitrite are produced by the reaction with Ag_2O; and (4) formation of nitrous oxide and nitrogen from the action of dinitrogen tetroxide on hyponitrites does not take place directly from N_2O_4 but originates from the hyponitrites. The thermal decomposition of the hyponitrites is shown to occur in the sequence $M_2N_2O_2$ yields M_2O plus N_2O and (2) $3M_2N_2O_2$ yields $2M_2O$ plus $2MNO_2$ plus $2N_2$. Lack of appearance of oxide in the products and appearance of nitrate can be ascribed to secondary reactions of the oxide and nitrite formed with N_2O_4 and NO_2.

14243

Peatman, W. B., T. B. Borne, and E. W. Schlag

PHOTOIONIZATION RESONANCE SPECTRA. I. NITRIC OXIDE AND BENZENE. Chem. Phys. Letters (Amsterdam), 3(7):492-497, July 1969. 21 refs.

A new method is described for the study of ionized molecules by direct observation of optical resonance in photoionization. This method interposes an electron filter in the system so that a signal is detected in the measuring circuit only at the point where the optical monochromator sweeps through a resonance transition. Photoionization is carried out at the intersection of a well-focused beam of light and a high intensity molecular beam at right angles to the photon beam. Electrons are withdrawn perpendicular to both of these beams. The energy of the photoionization resonance is directly read off the setting of the optical monochromator. Contributions from lower photoionization processes are avoided. Photoionization resonance scans of benzene show the presence of two peaks at 10.385 and 10.471 eV, respectively. It is thought that these peaks are due to a new electronic level of C6H6(plus) at 10.385 eV and that this level corresponds to the removal of a sigma electron from the benzene molecule. Data obtained for NO(plus) using this method were compared with data previously obtained by other methods. The average ionization potential of five experimental runs was in exact agreement with the spectroscopic value of other investigations.

14313

Lederer, E. L.

VERIFYING ADSORPTION FORMULAS BY MEANS OF ADSORPTION MEASUREMENTS WITH ACTIVATED CHARCOAL. (Pruefung von Adsorptionsformeln an Hand von Adsorptionsmessungen bei einer hochaktiven Kohle). Text in German. Kolloid-Z. (Stuttgart), 61(3):323-328, 1932. 15 refs.

Data reported by Remy on the adsorption of gases and vapors on activated charcoal were used to verify isothermal and isobaric adsorption laws. In the isothermal case, no decision can be made between a logarithmic law and the formula of Langmuir. In the isobaric case, a logarithmic law seems to fit the results best. The isosteric curve of Trouton and Poole and the relationship of Gurwitsch fit the data only moderately well. The relationship between the vapor pressure and the adsorbed volume of various gases indicates that equal amounts of different gases are adsorbed, referred to corresponding states. Gas mixtures are adsorbed proportionally, provided the concentrations are modified by the influence of the mean molecular velocities and the shape of the molecules. The adsorption data for the following gases were used: CO2, N2O, HCl, H2S, NH3, Cl2, CH3Cl, SO2, CH4, and COCl2.

14317

Warneck, Peter

PHOTODETACHMENT OF NO2(-). Chem. Phys. Letters (Amsterdam), 3(7):532-533, July 1969. 10 refs.

The photodetachment of electrons from NO2(-) ions by light in the violet portion of the visible spectrum was observed. Negative ions were extracted from a discharge source, accelerated to a speed of about 6,000,000 cm/sec, collimated, and mass separated in a 90 degree, stigmatically focusing magnetic analyzer. After passing the photodetachment chamber, the ions were trapped and discharged in a Faraday cup. Photoelectrons were withdrawn at right angles by a weak electric field and were detected with a venetian blind electron multiplier. The signal was processed by a phase sensitive amplification and was displayed on a strip chart recorder. The apparent photodetachment threshold is approximately 4740 A, which corresponds to an energy of 2.74 eV. The derived threshold energy provides only a lower limit to the vertical detachment energy because a portion of the NO2(-) ions are vibrationally excited. Subsequent to the formation of a negative ion in the discharge, the ion drifts toward the anode, picking up energy in the electric field and losing energy by collisions. This mechanism leads to a quasi-Boltzmann vibrational energy distribution among the ions equivalent to an estimated temperature of several thousand degrees. The excess vibrational energy cannot be dispersed because the radiative lifetime of the involved states is about one hundred times greater than the transit time of the ions in the apparatus. A semi-logarithmic plot of photoionization cross sections versus energy of ground state molecules, as compared to that of vibrationally excited ones, often indicates the beginning photoionization by a break in the cross section curve. A break occurred at 3.10 eV and was identified as the first ionization potential of NO2(-), so that 3.10 eV is the electron affinity of NO2. These results provided the first direct determination of the electron affinity of NO2.

14360

Ganz, S. N.

KINETICS OF ABSORPTION OF NITROGEN OXIDES BY SULFURIC ACID IN ROTARY ABSORBERS WITH A LARGE NUMBER OF REVOLUTIONS. (Kinetika absorbtsii okislov azota sernoy kislotoy v rotatsionnykh absorberakh s bol'shim chislom oborotov). Text in Russian. Zh. Prikl. Khim., 29(7):1018-1028, 1956. 5 refs.

Absorption of nitrogen oxides with 76 and 92% sulfuric acid in a high-rpm horizontal absorber was studied experimentally. The test absorber, designed to take advantage of bubbling, spray, and film absorption, is described in detail. The effectiveness of such absorbers for use in sulfuric acid production was demonstrated. Experimental data is used to determine rate coefficients for nitrogen oxide absorption as functions of disk rotation rate, volumetric gas flow rate, concentration of nitrogen oxides in the gas, sulfuric acid concentration, and temperature. These coefficients may be used for mechanical absorber design. It was established that with a highly turbulent regime, the absorption rate for an equimolar mixture of NO and NO2 exceeds the rate for NO2 alone but to a lesser degree than under conditions of film absorption.

14382

Pozin, M. E., B. A. Kopylev, and G. V. Bel'chenko

ABSORPTION OF NITROGEN OXIDES WITH A SODA SOLUTION IN A FOAM APPARATUS FOR THE PRODUCTION OF SODIUM NITRATE. (Pogloshcheniye okislov azota sodovym rastvorom v pennom apparate dlya proizvodstva nitrata natriya). Text in Russian. Tr. Leningr. Tekhnol. Inst. Imen. Lensoveta, vol. 36:120-32, 1956. 12 refs.

A foam apparatus proved effective for the alkaline absorption of nitrogen oxides for the purpose of producing nitrates and decreasing the loss of nitrogen oxides in the production of nitric acid. The coefficient of efficiency of a single platform-cascade apparatus was decreased from 30 to 16% on increasing the linear gas flow rate from 0.5 to 3 m/sec in a cross section of the foam apparatus. The coefficient of absorption increases with increase in the linear flow rate of the gas, attaining a value of 1860 kg/sq m-hr-kg/cu m, which was approximately 6-7 times larger than the value of the absorption coefficient for a packed column under laboratory conditions, and 20-25 times greater than for factory-type scrubbers. With increase in the rate of flow of the liquid, the efficiency of a single platform of the apparatus and the coefficient of absorption increased insignificantly. Thus, increase in the rate of flow of the liquid by 3 times (from 1 to 3 cu m/hr) at a gas flow rate of 1 m/sec leads to an increase in efficiency of 22-24%. Increase in the concentration of absorbent in solution from 5 to 20% Na_2CO_3 at a linear gas flow rate of 1 m/sec leads to a decrease in efficiency from 26 to 16%. Correspondingly, the coefficient of absorption is also decreased. If the initial concentration of nitrogen oxides in the gas is increased from 0.05 to 1.4% at a linear gas flow rate of 1 m/sec, the value of the efficiency of a single platform of the apparatus increased from 8 to 25%. Choice of the number of platforms in the apparatus can be based on the data for a single platform in accordance with the required degree of absorption of nitrogen oxides.

14384

Ioshpa, I. Ye.

KINETICS OF NITROGEN DIOXIDE ABSORPTION BY A SULFUR-NITROGEN MIXTURE. (Kinetika protsessa absorbtsii dvuokisi azota sernoazotnoy smes'yu). Text in Russian. Dokl. Vses. Nauch. Konf. Rab. Kafedr Tekhnol. Neorg. Veshchestv, Nauch. Uchrezhd. Proekt. Organ., 4th, Tashkent, 1964, p. 74-81.

If a sulfur-nitrogen mixture is saturated with a gas containing 32% NO_2 at 30 C, it is possible to obtain a solution containing 14-15% N_2O_3 and 10-11% HNO_3. It was found experimentally that at 30C, the absorption rate coefficient can be raised from 1.32 to 7.75 g/sq m-hr-mm Hg by irrigating the column packing with a solution of the following composition: 7.78% N_2O_3, 0.3788% HNO_3, 87.24% H_2SO_4, and 4.57% H_2O. An experimental curve was plotted which allows determination of the height of the packing and the mass-exchange surface area needed to achieve NO_2 removal to near equilibrium concentration. Curves are also given for determining the required packing surface area for saturation of a sulfur-nitrogen solution with NO_2 to the appropriate concentration with respect to N_2O_3 and HNO_3. The coefficient of absorption rate as a function of packing height was plotted and can be used to differentially calculate the required packing surface area under industrial conditions in series-connected towers. A correction factor is derived which relates the coefficient of absorption rate for the ring-shaped test packing to that of 25 times 25 times 3 mm industrial packing. This was done by examining the kinetics of absorption of ammonia by water on the same installation under the same hydrodynamic regime.

14385

Stezhenskiy, A. I., V. S. Luk'yanchikov, and V. B. Protsenko

OXIDATION OF NITROGEN DURING COMBUSTION OF METHANE-NITROGEN-OXYGEN MIXTURES. (Okisleniye azota pri gorenii metano-azoto-kislorodnykh smesey). Text in Russian. Khim. Prom. Ukr. (Ukr. Ed.), no. 1:7-9, 1967. 2 refs.

A methane-nitrogen-oxygen mixture was burned at a rate of 50 cu m/hr. Enriched air with an oxygen content of 40 to 73% was provided in an excess of 1.3 to 2.6. Inlet temperature ranged from 300 to 600 C and maximum NO yield (1.82%) was obtained with an oxygen content of 70% and an air excess of 1.7 (equivalent to equimolar nitrogen-oxygen ratio in combustion products). It is concluded that such a continuously operating arrangement for fixing atmospheric nitrogen has a number of advantages: constant NO concentration, ease of process control and possibility of automatic control, low thermal cycling assures prolonged and reliable operation of refractory materials made of MgO or ZrO_2. The combustion chamber used was described in an earlier article.

14416

Winter, E. R. S.

THE DECOMPOSITION OF NITROUS OXIDE ON THE RARE-EARTH SESQUIOXIDES AND RELATED OXIDES. J. Catalysis, 15(2):144-152, 1969. 14 refs.

The decomposition of N_2O, catalyzed by 15 M_2O_3 oxides including 11 of the rare earth-C crystal structure, is represented with reasonable accuracy at 10-20 cm by an equation where the desorption of molecular oxygen is an important rate-determining step; this is also the rate-determining step in the isotopic exchange between O_2 gas and the oxide surface by a dissociative process on the surface, which was recently measured for this series of oxides. A strong correlation exists between both A_o and E in the Arrhenius expression for the exchange reaction and the corresponding functions for N_2O decomposition. Since these functions vary in a regular manner with lattice parameter for the exchange reaction, so too do A_o and E for the decomposition of N_2O. No correlation was found for such properties as the magnetic moment of the M(III) ion which do not vary regularly with the lattice parameter. (Author abstract modified)

14471

Schischkov, D., M. Kojcharova, D. Iwanov, Z. Galunski, G. Dimov, K. Gruev, and D. Grueva

A STUDY OF THE CONVERSION OF CARBON MONOXIDE AND THE SIMULTANEOUS REMOVAL OF NITRIC OXIDE AND OXYGEN FROM THE SYNTHESIS GAS WITH LOW-TEMPERATURE CATALYSTS. (Studie ueber die Konvertierung von Kohlenoxid und die gleichzeitige Entfernung von Stickoxid und Sauerstoff aus Synthesegas mit Hilfe von Tieftemperaturkatalysatoren). Text in German. Allgem. Prakt. Chem. (Vienna), 20(3):68-70, 1969. 8 refs.

Low-temperature catalysts developed at the Chemical Technological Institute in Sofia, Bulgaria, were tested with respect to their activity in the conversion of carbon monoxide and hydrogenation of nitric oxide and oxygen. The synthesis gases had an average composition of 88% H2, 3.5% N2 and Ar, 5.4% CO, 2.5% methane, 0.6% CO2, up to 5 mg/cu m H2S, up to 0.5 ppm NO, and up to 1000 ppm O2. Catalytic activity was judged by the residual content of CO, NO, and oxygen in the synthesis gas. The basic constituents of the catalysts are the oxides of zinc, copper, and chromium. The specific surfaces of the non-reduced catalysts were between 30 and 60 sq m/g. To protect the catalysts against sulfur compounds, they were coated with a layer of desulfurized zinc oxide. Reduction of the catalysts took place at temperatures below 250 C with a gas mixture diluted with nitrogen. The results showed that the same carbon monoxide concentration was obtained with all catalysts. They further showed that the throughput velocity had a considerable influence on the residual CO content, but that this influence becomes weaker at higher temperatures. The catalysts have the capacity to reduce nitric oxide and oxygen, making it feasible to convert carbon monoxide and clean the synthesis gas in one step.

14514

Whittaker, Colin W., Frank O. Lundstrom, and Albert R. Merz

PREPARATION OF POTASSIUM NITRATE FROM SOLID POTASSIUM CHLORIDE AND NITROGEN PEROXIDE. Ind. Eng. Chem., 23(12):1410-1413, Dec. 1931. 7 refs.

By passing nitrogen dioxide gas through a tower packed with potassium chloride crystals containing 2.4% moisture, nearly complete conversion of potassium chloride to potassium nitrate was accomplished within 3 hrs. After the tower was flushed with oxygen to remove nitrogen-containing gases, the remaining salt had, after drying at 120 C, a nitrogen content corresponding to 92.23% potassium nitrate. As indicated by decided increases in temperature of the tower wall at the reaction zone, the reaction is exothermic. The small amount of water necessary for the reaction suggests that its function may be catalytic, perhaps by taking part in an intermediate reaction. The most complete conversion is obtained by continuing the nitrogen dioxide flow for a time after the reaction zone is passed. Nitrosyl chloride is produced simultaneously.

14570

Ivanov, V. N.

KINETICS OF NITRIC OXIDE DISSOCIATION STUDIED BY ABSORPTION SPECTROSCOPY. (Izucheniye kinetiki raspada okisi azota metodom absorbtsionnoy spektroskopii). Text in Russian. Izv. Akad. Nauk SSSR, Ser. Fiz., 27(1):35-37, 1963. 5 refs.

Dissociation of NO at concentrations of 0.32 to 1.94 times ten to the 19th power moles/cu cm at 650 C was studied by absorption spectroscopy, the rate of dissociation being determined from the intensity of the NO2 line. In all cases, equilibrium was reached in about 10 hrs. Introduction of 0.5% oxygen caused the dissociation rate to double, the resultant NO2 being the actual catalyzing agent. Comparison is made with contradictory data found in the literature.

14603

Shelef, M.

CATALYTIC REDUCTION OF NITRIC OXIDE. Franklin Inst. Research Labs., Philadelphia, Pa., Materials Science and Engineering Dept. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, Proc. First Natl. Symp. on Heterogeneous Catalysis for Control of Air Pollution, Philadelphia, Pa., Nov. 1968, p. 87-112. 24 refs.

A method was sought for the selective heterogeneous reduction of nitric oxide in the presence of excess oxygen. The decomposition rate of NO on a series of catalysts was studied in a conventional flow apparatus using NO as such or diluted with He. It was concluded that the decomposition reaction is too slow for practical application. The reduction of NO by CO was studied in the same flow system and used a mass-spectrometric technique. The hypothesis advanced is that the limiting stage of the oxidation mechanism with the participation of NO differs from that with O2. With O2 as the oxidizing agent, the rate-limiting catalyst-oxygen bond scission occurs during the reduction of the catalyst. In the oxidation with the participation of NO, the slow step may be the re-oxidation of an active site involving the accomodation of the nitrogen atom. The formation of the N-N bond is postulated, which for the formation of N2 requires the presence of a pair of NO molecules situated in close proximity. The requirement of the formation of the N-N bond may explain why the re-oxidation step of a surface site by NO could be a low probability event. The accepted view of NO chemisorption is through the nitrogen end of the molecule undergoing a surface rearrangement for the oxidation of a reduced surface site. The appearance of N2O is observed when passing NO on a reduced surface in the absence of CO, which supports the role of the N2O as an intermediate in the overall process. This hypothesis, which assumes the interaction of NO with the reduced surface as being the limiting process, explains the preferential participation of oxygen in the oxidation of CO when competing in this reaction with NO. It also explains the absence of the correlation between the surface-oxygen bond strength and the catalytic activity sequence in the CO-NO reaction, which is Fe2O3, Cu2O, Cr2O3, NiO, Co3O4, MnO, V2O5 in the order from most active to least active. This is out of the pattern observed in reactions where oxygen is the oxidizing agent.

14620

Briner, E., G. H. Lunge, and A. van der Wijk

RESEARCH ON THE REACTIONS BETWEEN NITROGEN PEROXIDE AND SULFUR DIOXIDE. (Recherches sur les reactions entre le peroxyde d'azote et l'anhydride sulfureux). Text in French. Helv. Chim. Acta, vol. 11:1125-1144, 1928. 15 refs.

Laboratory techniques for studying the reactions of nitrogen dioxide and sulfur dioxide, both in the liquid and gas phase, are elaborated. In the liquid phase, under 100 atm pressure, the following overall reaction occurs: 3/2 N_2O_4 plus 2SO_2 yields $S_2N_2O_9$ plus NO. The compound $S_2N_2O_9$ behaves like an anhydride of nitrosyl sulfuric acid in its reactions with water, alkali, and SO_2. It is stable at ordinary temperatures even in a vacuum. Heat decomposes it into the compounds S_2NO_7 and NO_2; the reaction is slightly reversible. The reaction forming $S_2N_2O_9$ from liquid sulfur dioxide and liquid dinitrogen tetroxide is very exothermic; its heat of reaction has been evaluated at 112 cal/g-mole. In the gas phase, the reaction between dinitrogen tetroxide and SO_2 proceeds somewhat slowly at ordinary temperatures and pressures and more rapidly at elevated temperatures. Reaction products at 80 deg and above have an average nitrogen content less than that of the compound $S_2N_2O_9$. Curves representing the course of this reaction reached a plateau long before it had been formed. The reaction does not take place if the gases are placed in contact at sufficiently low pressure. In the presence of catalysts, the reaction is very rapid but does not go to completion even at low pressures.

14624

Rozlovskiy, A. I. and Ye. P. Rodin

HIGH-TEMPERATURE CHILLING OF NITROGEN OXIDES. (Vysokotemperaturnaya zakalka okisi azota). Text in Russian. Doklady Akad. Nauk SSSR, 177(2):397-400, 1967. 9 refs.

This thermodynamic analysis of nitrogen oxidation, based on the literature, is directed toward an understanding of the effects of 'chilling' of the reaction products at high temperatures. Cooling rate as a function of temperature is plotted over the range 1900-4200 K for an equimolar N_2-O_2 mixture at 1 atm for an NO concentration of 15%. Nitrogen oxide losses during chilling are tabulated for temperatures ranging from 2663 to 4000 K at pressures of 0.77, 1, and 10 atm, with an O_2-N_2 ratio of 1:1, 1:4, or 1:10, and chilling rates ranging from 20,000 to 100,000,000 deg/sec.

14635

Safiullin, N. Sh. and A. N. Tseytlin

ABSORPTION OF NITROGEN OXIDES BY SULFURIC ACID. (Absorbtsiya okislov azota sernoy kislotoy). Text in Russian. Zh. Prikl.

Khim., vol. 36:490-495, 1963. 15 refs.

Studies made with gases containing 0.15-0.20% NO-NO_2 showed that the absorption of nitrogen oxides increases with an increase in sulfuric acid concentration up to 85%, but that further increase in concentration has no significant effect on absorption rate. Increasing the linear rate of the gas above 0.5 m/sec and the reflux density above 6-7 cu m/sq m-hr has no noticeable effect on the rate or completeness of absorption. As the N_2O_3 content of the sulfuric acid increases (from 0 to 4.4% HNO_3), the absorption rate of nitrogen oxides decreases by 8%. The absorption rate is significantly affected by the process temperature; relative absorption rates at 18, 40, and 60 C are 1, 0.48 and 0.38, respectively.

14636

Rogers, R. and B. H. Sage

SOME STUDIES OF THE OXIDES OF NITROGEN. Office Naval Res., Monthly Res. Rept., p. 23-25, Jan. 1952. 9 refs.
ATI: 139788

An evaluation of the specific volume, thermal conductivity, and viscosity of the liquid phase of nitrogen dioxide and its mixtures with nitric oxide show that these compounds are suitable oxidizing components for binary liquid propellant systems. The compressibility of saturated nitrogen dioxide first increases, then decreases with a progressive rise in temperature. This anomaly is not present in the case of the liquid, where specific volume is a function of pressure and temperature. Under usual operating conditions, the vapor pressure of nitrogen dioxide will remain below 100 psi. The relatively high freezing point of nitrogen dioxide is effectively lowered by solutions of nitric oxide, which increase two-phase pressure. Twenty wt% nitric oxide increases the bubble point pressure of nitrogen dioxide mixtures to 445 psi at 180 F. The vapor pressure of pure nitrogen dioxide at this temperature is about 196 psi. Nitric oxide is more nearly a perfect gas than nitrogen dioxide, deviating only about 5% from the behavior of a perfect gas at pressures up to 2500 psi at 100 F. Its compressibility factor is a function of pressure for several temperatures. Neither nitrogen dioxide nor nitric oxide undergoes significant decomposition when stored in steel containers.

15023

Flynn, G. W., M. A. Kovacs, C. K. Rhodes, and A. Javan

VIBRATIONAL AND ROTATIONAL STUDIES USING Q SWITCHING OF MOLECULAR GAS LASERS. Appl. Phys. Letters, 8(3):63-65, Feb. 1, 1966. 5 refs.

Vibrational and rotational relaxations in the CO_2 and N_2O laser systems were studied by Q-switching techniques. It is shown that during the time in which Q-switching takes place, thermalization of the rotational levels can be prevented.

Thermalization in the presence of laser oscillation leads to a coupling between various rotational levels and, consequently, a decrease in the number of oscillating laser transitions. At low pressures, where thermalization rates are slow, the populations of various rotational bands are entirely decoupled during the Q-switched pulse and various rotational transitions oscillate independently. At elevated pressures thermalization occurs even during Q-switching time. The presence of a nonthermal population distribution within the rotational levels is an important consequence of the lack of thermalization during the Q-switch period. This implies the presence of sizeable population inversion within the levels during the Q-switch period.

15166

Moruzzi, J. L., J. W. Ekin, Jr., and A. V. Phelps

ELECTRON PRODUCTION BY ASSOCIATIVE DETACHMENT OF O(-) IONS WITH NO, CO, AND H2. J. Chem. Phys., 48(7):3070-3076, April 1, 1968. 26 refs.

Electron currents produced in associative detachment reactions involving O(-) ions were detected and measured in an electron drift tube. The reactions studied were those between O(-) and NO, O(-) and CO, and O(-) and H2. The associative-detachment rate coefficients were obtained from analyses of the electron current waveforms. The results indicate that the associative detachment proceeds by a two-body process. The observed rate coefficients are consistent with results obtained from studies of O(-) destruction using mass spectrometric techniques. Associative detachment rate coefficients of 2.2, 6.5, and 7.5 times 10 to the minus 10th power cu cm/sec were measured at near-thermal ion energies for the O(-) plus NO, O(-) plus CO, and the O(-) plus H2 reactions, respectively. The average energy of the O(-) ions ranged from thermal up to 0.16 eV. A search for a reaction between O2(-) and CO was unsuccessful, indicating that the rate coefficient of this reaction is less than 10 to the minus 14th power cu cum/sec. (Author abstract modified)

15196

Moeller, G. and J. Dane Rigden

OBSERVATION OF LASER ACTION IN THE R-BRANCH OF CO2 AND N2O VIBRATIONAL SPECTRA. Appl. Phys. Letters, 8(3):69-70, Feb. 1, 1966. 8 refs.

By using a diffraction grating as the reflecting element at one end of a laser cavity, oscillations were obtained for 170 lines in P and R branches of the following bands: 00(zero-th angular momentum state)1-10(zero-th ams)0, and 00(zero-th ams)1-02(zero-th ams)0 vibrational bands of CO2; and the 00(zero-th ams)1-10(zero-th ams)0 bands of N2O. Laser action reached J values over 50 in some cases. Of the total number of lines, 103 are in CO2. As the grating rotates to make the laser cavity resonant at different wavelengths, the emission spectrum of each line is recorded. The laser admission is confined to narrow frequency ranges near the center of each peak and the apparent width of emission lines is caused by lack of resolution in the grating mirror, but no attempt was made to utilize the full width of the grating to attain the maximum resolution. This can be accomplished by placing the grating at some distance from the active plasma. The emission spectra were obtained by existing only 2 m of the 6 m-long laser tube. It is assumed that the grating device can be applied to a study of other high-grain infrared bands.

15197

Paulson, J. F.

SOME NEGATIVE ION REACTIONS IN SIMPLE GASES. In: Symp. Ion-Molecule Reactions in the Gas Phase, Robert F. Gould (ed.), Washington, D. C., American Chemical Society, 1966, p. 28-43. 20 refs. (Presented at the Am. Chem. Soc., 152nd Meeting, New York, N. Y., Sept. 12-13, 1966.)

Charge transfer and ion-atom interchange reactions of D(-) with D_2O and of O(-) with O_2, N_2O, and NO_2 were studied with a magnetic sector mass spectrometer. Competition between electron transfer and ion-atom interchange was observed in the production of O_2(-) by reactions of O(-) with O_2, an endothermic reaction. The negative ion of the reacting molecules is formed in O_2, N_2O, and NO_2, but not in D_2O. Rate constants were estimated as a function of repeller potential. These studies are considered preliminary in the sense that the rate constants obtained are averages over a wide range of interaction energies and may not apply to ions having well-defined kinetic energies. Definitive tests of the dependence of these rate constants upon kinetic energy can only be carried out using ion beam techniques in which angular distributions of the products are measured. (Author abstract modified)

15225

Miescher, E.

ANALYSIS OF THE SPECTRUM OF THE NITRIC OXIDE MOLECULE. (Basel Univ. (Switzerland), Dept. of Physics, Grant AF-EOAR-65-74, AFCRL-69-0268, 9p., April 15, 1969. 17 refs.
DDC: AD 689 398

The vacuum-ultraviolet absorption spectrum of four different isotopes of nitric oxide gas was photographed with the most powerful existing spectrographs. The infrared and the visible emission spectrum emanating from a discharge through rapidly streaming NO also was recorded with very large instruments. In the vacuum-ultraviolet, it was photographed with a 1 meter grating. Comprehensive rotational analyses of the many band structures observed on the plates were carried out. The result of the investigation is the knowledge of the excited states of the NO molecule exceeding the present knowledge for any other molecule as far as completeness and theoretical understanding is concerned. Several novel features in band structures could be studied, particularly electronic interactions and extreme Rydberg state uncoupling. Important molecular constants could be derived with high accuracy. (Author abstract modified)

15227

Niles, F. E.

AIR-LIKE DISCHARGES WITH CO2, NO, NO2, AND N2O AS IMPURITIES.
Ballistic Research Labs., Aberdeen Proving Ground, Md., BRL-R-1437
73p., June 1969. 14 refs.
AD 690816

Computer solutions to 24 times-rate-of-change equations were obtained for air-like discharges attainable in a laboratory designed for the study of reactions of ionospheric importance. The manner in which the solutions are affected by initial number densities of CO2, NO, NO2, and N2O, corresponding to the impurity levels of 0, 0.1, 10, and 1000 ppm, is presented. Solution of the time-rate-of-change equations demonstrated the importance of knowing the initial concentrations of minor constituents. The initial N2O densities did not affect the solutions. The initial CO2 densities are not very important to the solutions. The CO3(-) solutions are influenced by the ozone density, which is affected by the NO2 density. The initial NO2 density greatly affects the reactions forming the negative ions. The initial NO density greatly affects the observable positive ion densities. While the solutions were obtained for the laboratory facility, similar effects on the charged particles in the upper atmosphere can be expected for various densities of NO and NO2. Hence, measurements of the NO and NO2 densities should accompany charged particle measurements in the upper atmosphere.

15243

Meijer, R. J.

THE PHILIPS-STIRLING ENGINE. (Der Philips-Stirlingmotor).
Text in German. Motortech. Z. (Stuttgart), 29(7):284-298, July
1968. 14 refs.

The development of the Philips-Stirling engine is described and it advantages are enumerated. The engine is based on the principle c moving gas back and forth between a hot chamber and a cold chamber by a displacement piston. Development of the Stirling principle began in 1938 in the Philips research laboratories with the construction of small hot-air engines. Through the invention of the double acting engine, the path to larger Stirling engines was opened. Development of the rhombic gear in 1953 permitted operation with a pressureless crankcase. Hydrogen and helium replaced air. The engine efficiency could be raised to 38%, the specific power to 110 hp referred to the piston displacement volume. Better gaskets improved the longevity of the engine. The problems of thermal tension and heat transfer have been solved. Laboratory models of 10, 40, and 90 hp per cylinder have been buil and tested while experiments on a model with 400 hp per cylinder are under way. A Stirling engine performs as well as or even better than a diesel engine. If the Stirling engine is driven wit a fossil fuel, the exhaust gases are quite clean. They contain no CO or hydrocarbons owing to a steady combustion in a chamber fence in by hot walls. Concentrations of NO and NO2 are low. A table comparing the exhaust gas composition of the Stirling engine with a gas turbine indicates this quite clearly. The reason for the reduction in emissions is not fully understood since flame temperatures in the burner are very high. To study the relationship between the temperature of the preheated air and the NOx content, an electrically driven air preheater was installed in a 90 hp one-cylinder engine. It was found that the NOx content decreases with decreasing temperature of the preheated air. If part of the exhaust gas is returned to the combustion air, the NO content can be further reduced.

15253

Young, R. A., G. Black, and T. G. Slanger

VACUUM-ULTRAVIOLET PHOTOLYSIS OF N2O. III. REACTION RATES OF O(S1). J. Chem. Phys., 50(1):309-311, Jan. 1, 1969. 13 refs. (Also: Stanford Research Inst., Menlo Park, Calif., Contracts Da-31-124-ARO-D-434 and DA-31-124-ARO-D-446 and Grant 544, Repts. 5134.11-P and 6093.11-C, 1969.)
AD 686936

Photolyses of N2O at 1470 A (Xe resonance lamp) and CO2 at 1048 + 1067 A (argon resonance lamp) were used as sources of O(S 1) atoms. Quenching rate coefficients for this species relative to those for N2O or CO2 were determined for a wide variety of gases (NO, C2N2, O2, CO, H2, CH4, N2, Ar, He, ethylene, and acetylene).

15268

Kovacs, M. A., G. W. Flynn, and A. Javan

Q SWITCHING OF MOLECULAR LASER TRANSITIONS. Appl. Phys. Letters, 8(3):62-63, Feb. 1, 1966. 3 refs.

Q-switching techniques were applied to an investigation of CO2 and N2O molecular laser transitions. A Brewster-angle discharge was used, and the Q-switched laser was operated either with dc excitation of the discharge by means of internal electrodes or with rf excitation by means of external electrodes. The optimum Q-switching performance was achieved in an N2-CO2-HE mixture. It was obtained at the highest mirror rotation speeds. At low speeds multipulsing occurred. The relaxation time for CO2 laser levels is less than 2 msec. The energy storage time in each Q-switched pulse is determined by lifetimes of the CO2 levels and is not less than 0.3 msec. The width of the pulses is less than the response time of the detector and is 20 nsec or less. Accordingly, the power in each Q-switch pulse of 1 mJ energy is about 50 kW.

15272

Young, R. A., G. Black, and T. G. Slanger

VACUUM-ULTRAVIOLET PHOTOLYSIS OF N2O. II. DEACTIVATION OF N2(A 3(SIGMA SUB U)+) AND N2(B 3(PI SUB G)). J. Chem. Phys., 50(1):303-308, Jan. 1, 1969. 27 refs. (Also: Stanford

Research Inst., Menlo Park, Calif., Contracts DA-31-124-ARO-D-434 and DA-31-124-ARO-D-446 and Grant GA-544, Repts. 5134.10-P and 6093.10-C, 1969.)
AD: 687064

Quenching of N2(A 3(sigma sub u)+), produced during photodissociation of N2O by 1470 A radiation, was studied using the NO gamma-band emission as a monitor. The relative quenching efficiencies of a variety of gases are given. At 1236 A, the state of N2(B 3(pi sub g)) was produced during photolysis of N2O and the variation of the intensity of N2 first positive emission with N2O pressure was used to evaluate the quenching rate of N2(B 3(pi sub g)) by N2O. The value obtained was 1.6 times 10 to the minus 10th cc/molecule/sec. Quenching efficiencies for other gases (NA3, NO, C2N2, O2, CO, CO2, H2, CH4, N2, Ar, He, ethylene, and acetylene) were determined relative to N2O and are given. (Author abstract modified)

15353

Scholten, J. J. F. and J. A. Konvalinka

REACTION OF NITROUS OXIDE WITH COPPER SURFACES. APPLICATION TO THE DETERMINATION OF FREE-COPPER SURFACE AREAS. Trans. Faraday Soc., vol. 65 Part 9(561):2465-2473, Sept. 1969. 14 refs

Oxygen adsorption via nitrous oxide decomposition on various copper powder samples and three copper-on-MgO catalysts was investigated from 0 to 140 C at 20 cm Hg. As with germanium, the reaction of nitrous oxide with copper surfaces has an activation energy that increases with coverage. Plots of oxygen chemisorption via nitrous oxide decomposition at various temperatures as a function of contact time show that adsorption increases with temperature, indicating that there is no adsorption equilibrium. Because of the activated nature of the N2O decomposition-adsorption process, small increases in temperature of the samples caused by the heat of reaction can result in higher coverages. The magnitude of such small temperature rises will depend on the surface area per g and on the heat dissipation during measurements; this accounts for the poor reproducibility of the coverages found at 0, 20, and 50 C. Measurements of free-copper surface areas of catalysts around 90 to 100 C show better reproducibility. There is a full surfac coverage in this range, so that a relatively high kinetic barrier has to be overcome before bulk oxidation sets in. The lower reactivity in both surface and bulk reactions of nitrous oxide as compared with that of oxygen is discussed. It is presumed to be related to the difference in electronic structure of the two molecules. The linear nitrous oxide molecule has the lower reactivity, since it is apparently stabilized by resonance Oxygen is more reactive owing to its pseudo-radical character caused by the presence of two unpaired electrons.

15495

Atroshchenko, V. I., G. K. Goncharenko, and S. G. Sedasheva

KINETICS OF ABSORPTION OF NITROGEN DIOXIDE BY SOLID CALCIUM OXIDE. (Kinetika vbirannya dvookisu azotu tverdim okisom kal'tsiyu). Text in Ukrainian. Khim. Prom. Inform. Nauk Tekh. Zh., no. 1:27-29, Jan.-March, 1965. 1 ref.

Experimental study of the absorption kinetics for 10% nitrogen dioxide over solid calcium oxide was made at 50-300 C. The absorption rate constant at these temperatures ranged from 0.0572 to 0.572, while the corresponding degree of absorption increased from 7.3 to 46.5%. These values were determined at 7-9% saturation of the absorbent, which occurred in 0.191-0.107 sec. Reducing NO_2 concentration to 5% resulted in a 10-20% reduction in the degree of absorption. This reaction is recommended for production of calcium nitrate fertilizer.

15536

Dodonova, N. Ya. and V. V. Sobolev

INFRARED EMISSION OF NITRIC OXIDE IN ELECTRICAL DISCHARGE. Vestn. Leningr. Univ., Ser. Fiz. i Khim., 2(10):3-5, 1956. 4 refs. Translated from Russian. Dept of the Army, Fort Detrick, Frederick, Md., 4p., Aug. 1956.
CFSTI, DDC: AD 682563

The emission of nitric oxide in an electrical discharge at pressures of 10-200 mm Hg was studied. Nitric oxide was produced by a solution of KNO_2 + KI reacting with dilute sulfuric acid and was dried with phosphorus pentoxide and sulfuric acid. The emission spectrum obtained from the discharge had maxima at 3, 4.4, and 4.8 microns. Comparison of the NO emission spectrum with the absorption spectra of NO showed that the bands which were detected do not belong to NO, but to oxides of nitrogen formed in the discharge by decomposition of NO and by chemical reactions. The only exception may be the 3 micron band which could belong to NO. It was concluded that the addition of nitrogen to the nitric oxide in the discharge does not affect the emission intensity of the 4.8 micron band. This does not agree with previous views.

5756

avalles, Henri, Gerard Dorthe, and Michel Destriau

EACTION OF OXYGEN WITH NITROUS OXIDE. (La reaction de l'oxygene avec l'oxyde azoteaux). Text in French. Bull. Soc. Chim. France, no. 9:3088, 1969. 4 refs.

A study of the chemiluminescence that occurs when nitrous oxide and hydrogen react at temperatures and pressures of 726 C and 300 mm Hg and 820 C and 600 mm Hg, refutes the hypothesis that in the following sequence of reactions, the last two are of little significance: N_2O + N_2O yields N_2 + O + N_2O; O + H_2 yields OH + H; O + N_2O yields 2 NO; and O + NO yields NO_2 yields NO_2 + hv. It is concluded that it would be difficult to account for the luminous emission if the last reaction does not take place.

15764

Holliday, Michael and Bryan Reuben

THE REACTION OF HYDROGEN WITH NITROUS OXIDE. (La reaction de l'hydrogene avec l'oxyde azoteux). Text in French. Bull. Soc. Chim. France, no. 9:3087, 1969. 6 refs.

The mechanism of the reaction between hydrogen and nitrous oxide was discussed. The activation energy of the reaction was approximately 62.5 kcal. This was in accordance with the initial reaction, N_2O yields $N_2 + O$ followed by a series of intermolecular chain-breaking reactions. The effect of adding nitric oxide to the system was also examined. Results were best explained by the reaction of OH and H radicals, rather than O radicals with nitric oxide. This mechanism was in agreement with the known rate constant of the reaction. Chemiluminescene was not observed in the slow reaction and it appeared that this was due to a relatively insignificant side reaction rather than a maj termination process. (Author abstract modified)

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Yamate, Noboru

PHOTOCHEMICAL STUDIES OF AIR POLLUTION. II. STUDIES ON PHOTOCHEMICAL PRODUCTS OF AUTO EXHAUST. (Taiki osen no kokagaku kenkyu (dai 2 ho) jidosha haiki gasu no koshosha seiseibutsu ni tsuite). Text in Japanese. Eisei Kagaku (J. Hyg. Chem.), 15(4):248-252, 1969. 5 refs.

Automobile exhaust was irradiated with xenon or solar light under static conditions, and the concentration changes of hydrocarbons, nitrogen oxides, formaldehyde, and irradiation products were analyzed. Hydrocarbon concentrations were determined by hydrogen-flame ionization gas chromatography; nitrogen oxides and formaldehyde concentrations, by colorimetry; and irradiation products, by electron-capture gas chromatography. Irradiation decreased the concentrations of hydrocarbons and nitrogen oxides but increased formaldehyde concentrations. The irradiation products were methyl nitrite, ethyl nitrite, methyl nitrate, ethy nitrate, n-propyl nitrate, isobutyl nitrate, biacetyl, and peroxyacetyl nitrate. These photochemical reactions of auto exhaust presumably occur in the atmosphere.

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Hettche, O. *09393-B
Heuss, J. M. 14119-F
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Hilst, G. R. *11225-E *14997-J
Himi, Y. 13070-D
Himmelblau, D. M. *13541-M
Hind, C. J. *14297-E
Hindawi, I. J. 00961-G
Hine, C. H. *00428-F *03890-F 14050-F
Hinners, R. G. *01987-F *00142-D
Hirao, O. *06144-E
Hirsh, M. N. *02883-D
Hisatsune, I. C. *00700-M *03349-M 05286-M *05288-M *05289-M *05290-M
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Hofmeister, H. K. *09721-D
Hogger, D. *08801-F
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Hollenbeck, A. H. 01357-D
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Holzworth, G. C. 00346-J
Honour, A. J. *01175-F 02871-F
Hoover, G. M. *08838-D
Horiuchi, K. 07166-J
Horn, K. *07230-B *11568-F *00411-L
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Horsley, R. R. 06086-B
Horstman, S. W. 00005-J
Horton, J. F. 01495-D
Hosler, C. R. 03725-J
House, W. B. *06341-F
Hovey, H. H. *00673-B *04833-J
Howe, E. L. 02001-B
Hsieh, Yu. H. *14007-E
Huber, T. E. *00932-F
Huenigen, E. *10553-K *14475-L
Huetter, F. G. *00473-F 02332-F *03823-F 07842-F
Huls, T. A. *09323-B *00592-B
Hummel, H. 02645-D 09721-D
Hunigen, E. *00562-E *08803-L
Hunter, J. B. *14309-E
Hurn, R. W. *01381-B *01382-B *01384-B *14116-B *00241-J *06698-M *10129-M
Hutchison, D. H. 04994-B

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Iritani, T. 04181-B
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Ivanova, F. A. 04221-F
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Ivie, J. O. 01349-D 06460-D
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Jacumin, W. S. *02747-D *00992-F
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Jaffe, S. *11279-M *13889-M
Jaros, G. D. *00469-D
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Jewell, R. G. 05153-E 14093-E
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Joba, E. L. 00695-H
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*08026-F *11539-F
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Mingle, J. G. 00569-E 01854-E
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Moore, G. E. *06911-D
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Newbury, B. C. *04880-D
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